RETURN PREDICTABILITY CONDITIONAL ON THE CHARACTERISTICS OF INFORMATION SIGNALS

by

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ABSTRACT

This dissertation examines whether simultaneously conditioning on the multidimensional characteristics of information signals can help predict returns that are of economic significance. We use large price changes, public announcements, and large volume increases to proxy for the magnitude, dissemination, and precision of information signals. Abnormal returns following large price change events are found to be unimportant. As we condition on other characteristics of information signals, the abnormal returns become large. Large price change events accompanied by both a public announcement and an increase in volume have a 20-day abnormal return of almost 2% for positive events and -1.68% for negative events. The type of news provides further refinement. If the news relates to earnings announcements, management earnings forecasts, or analyst recommendations then the 20-day abnormal returns becomes much larger: ranging from 3% to 4% for positive events and about -2.25% for negative events. For these news events, we also find that the underreaction is greater for positive (negative) event firms that underperformed (overperformed) the market in the prior period, earning 20-day post-event abnormal returns of 4.85% (-3.50%). This evidence is consistent with the Barberis, Shleifer, and Vishny (1998) model of investor sentiment that suggests that investors are slow to change their beliefs. The evidence from our sample does not provide much support for strategic trading models under information asymmetry. Finally, an out-of-sample trading strategy generates 20-day post-event statistically significant abnormal return of 2.18% for positive events and –2.40% for negative events. Net of transaction costs, the abnormal returns are a statistically significant 1.04% for positive events and a statistically significant –1.51% for negative events.

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CHAPTER 1

INTRODUCTION

There is an extensive literature on short-run stock return predictability following events signaling release of new information. Proxies for release of new information used are large price changes, volume increases, or public announcements. Previous studies have examined whether the market reacts instantaneously to information events, and if not, then is the initial reaction biased in that it leads to predictable price patterns following the event. Each of the information event proxies used in the literature captures a distinct characteristic of information signals. The price change captures the magnitude, volume captures the precision or quality, and public announcements captures the level of dissemination of information signals.

Blume, Easley and O'Hara (1994) note that price change is a good proxy for a signal's magnitude. Studies which examine return predictability conditional on the magnitude of an information signal can be divided into two groups. The first group consists of studies which examine price patterns following large one-day price changes. These studies find mixed evidence. Though most of these studies have found evidence of overreaction following large positive and negative one-day price change events, a few have found that the market underreacts to negative price change events. However, most of these studies note that these predictable price patterns cannot be profitably exploited in the face of transaction costs. The other group consists of studies that examine whether contrarian or momentum investment strategies earn abnormal returns.[1] These studies form portfolios of securities based on their past returns and examine whether these portfolios earn abnormal returns in the future. These studies have found evidence of both price continuations and price reversals, albeit for different return intervals. Lehmann (1990) and Jegadeesh (1990) provide evidence of return reversals over weekly and monthly horizons respectively. On the other hand, Jegadeesh and Titman (1993) find that momentum investment strategies earn abnormal returns at horizons of 3 to 12 months. However, these strategies are transaction intensive and therefore might not be profitable after taking into account transaction costs. Also, the apparent profitability of contrarian strategies of Lehmann (1990) and Jegadeesh (1990) arise largely due to the bid-ask bounce effect and cannot be profitably exploited.

A second distinct characteristic of an information signal is its precision. An imprecise signal is a signal of low quality or high noise. Several heterogeneous agent models of competitive trading show that imprecise signals lead investors to have different demand prices for the same asset. This is in turn generates speculative trading by these diversely informed traders. As a result, volume captures the level of precision of a signal. Blume, Easley and O'Hara (1994) note that as volume captures the quality of information, it can provide useful information about future returns. Surprisingly, few empirical studies have examined whether volume can help predict future returns. Over weekly horizons, Conrad, Hameed and Niden (1995) find evidence of price reversals following increases in volume and price continuations following low volume. On the other hand,

[1] A contrarian investment strategy buys past losers and sells past winners, whereas a momentum strategy buys past winners and sells past losers. Therefore, contrarian strategies rely on price reversals and momentum strategies on price continuations for profitability.

Cooper (1998) finds that increases in volume leads to weaker reversals. Over intermediate horizons of 3 to 12 months, Lee and Swaminathan (1998) find that a strategy of buying past high-volume winners and selling past high-volume losers outperforms the traditional momentum strategy of buying past winners and selling past losers by 2% to 7% per year. However, these studies do not try to distinguish volume generated by speculative traders from volume generated by liquidity traders. This could be important as volume generated by liquidity traders is not related to signal precision. Therefore, using volume per se is a noisy proxy for signal precision. Also, speculative and liquidity trades could affect future prices in opposite directions. Campbell, Grossman and Wang (1993) show that an increase in volume due to liquidity trades will result in price reversals. On the other hand, though Blume, Easley, and O'Hara (1994) don't state whether an increase in volume will result in price continuations or price reversals, price continuations cannot be ruled out. Therefore, though previous studies have found that volume is able to predict future returns, it is likely that the predictive ability of volume can be increased if we distinguish volume generated by liquidity trades from volume generated by speculative trades.

A third characteristic of a signal is its level of dissemination. Public announcements release new information while achieving a high level of dissemination. In addition to capturing the level of dissemination of an information signal, the type of public announcement is also likely to be related to the precision of the signal. For example, legal and legislative announcements are likely to be high precision signals as they resolve some underlying uncertainty regarding firm value, whereas earnings announcements are likely to be signals of moderate precision as there is much ambiguity about how current earnings are related with future earnings.

Studies which examine the price discovery process around public announcements have found evidence of underreaction. There is a large body of literature which finds evidence of market underreaction to earnings announcements (see Bernard, 1992). These studies find that the market underreaction is more severe to surprisingly good and bad earnings news. Among studies related to other types of public announcements, Michaely, Thaler, and Womack (1995) present evidence of market undereaction to dividend initiations and omissions, Ikenberry, Lakonishok and Vermaelen (1995) find that market underreacts to open market share repurchases, and Womack (1996) finds that the market underreacts to analyst recommendations.

Since each of the three information proxies used in the literature captures a distinct characteristic of information signals and has some power to predict future returns, it is logical to ask whether simultaneously conditioning on these proxies can help improve return predictability. Surprisingly, none of the studies in the literature has examined this issue. This dissertation seeks to fill this void by examining whether simultaneously conditioning on all three signal-identifying proxies can help improve return predictability.

We begin with a sample of abnormally large one-day price change events. Carefully avoiding the pitfalls related to market microstructure issues, we find that unconditional post-event abnormal returns are economically *in*significant, though sometimes statistically significant. The results become more interesting when we condition on the other signal characteristics. Conditional on a public announcement, investors earn an average 20-day abnormal return of +1.25% following positive events and –1.62% following negative events. For the "no public announcement" categories, there is no significant underreaction. If large price changes are accompanied by a public announcement as well as an increase in volume then the 20-day abnormal return is about 2% for the positive events sample and –1.68% for the negative events sample.

Next, we consider the type of announcement. If earnings announcements, earnings forecasts by management, and analyst recommendations are accompanied by a large increase in volume and a large price change, then the underreaction is large: about 3.50% over a 20-day period for the positive events and –2.25% for negative events. The extent of underreaction is more severe than that reported in previous papers, which is further magnified by the fact that our sample consists primarily of large firms and so makes the predictable price patterns potentially tradable. Further, the role of volume in increasing the magnitude of underreaction is new to the literature. We also find that the market reaction to news related to restructuring, capital structure changes, general business issues, and legal and legislative issues is generally unbiased. For these events, we find some support for the reasoning that the market is able to adjust quickly to the new information as there is resolution of some underlying uncertainty regarding firm value.

Consistent with the Barberis, Shleifer, and Vishny (1998) model of investor sentiment, we find that investors are reluctant to quickly alter their beliefs. The pre-event abnormal returns are negatively correlated with the post-event drift implying that the greater the shock of new information, the longer it takes for prices to reflect new information. However, the underreaction in this sample does not lend much support to strategic trading under information asymmetry models or to institution-induced momentum strategies. Based on investor sentiment, if the sample is further divided by pre-event abnormal returns then the price continuation is more compelling. The 20-day abnormal return is about +4.85% (-3.50%) for positive (negative) events preceded by negative (positive) pre-event abnormal returns and accompanied by an increase in volume and news related to earnings or analyst recommendations.

Finally, an out of sample test of a trading strategy of buying (selling) positive (negative) price event firms accompanied by an increase in volume and news relating to earnings announcements, management earnings forecasts, or analyst recommendations earns a statistically significant 20-day abnormal return of 1% to 1.5% after transaction costs (excluding commission costs).

This study has broad implications for market efficiency. The large magnitude of drift over a short period following the event suggests the possibility of profitable trading strategies which simultaneously use information in past returns, volume and news releases. The study also has implications for event studies. Event studies usually measure abnormal returns over the period Day -1 to Day 0 to capture the information conveyed by a public announcement. However, the results herein imply that the market underreacts and so only part of the information conveyed by a public announcement is captured in prices by day 0. This is important for cross-sectional studies because the magnitude of underreaction can vary significantly depending on event day volume and investor beliefs.

The rest of the dissertation is organized as follows. Chapter 2 surveys the literature and Chapter 3 presents the hypotheses. Chapter 4 describes the data and sample selection procedure. Chapter 5 discusses the methodology to calculate abnormal returns and presents the results for events with and without public announcements and volume changes. Chapter 6 explores the determinants of the post-event abnormal returns with particular reference to strategic trading under information asymmetry and investor sentiment. Chapter 7 presents the results of an out of sample implementation of our trading strategy. Chapter 8 concludes the dissertation.

CHAPTER 2

LITERATURE REVIEW

Magnitude, precision and dissemination are major characteristics of information signals. In this chapter, we discuss these three characteristics of information signals, the variables used to proxy for each of these characteristics, and the related theoretical models and empirical evidence.

2.1 Magnitude of information signals

The first property of a signal, its magnitude, measures the signal's importance. Blume, Easley, and O'Hara (1994) note that price change is a good proxy for a signal's magnitude. Many studies have examined the ability of a signal's magnitude to predict future returns. These studies can be divided into two groups.

The first group consists of studies which examine price patterns following large one-day price changes. Brown, Harlow, and Tinic (1988) define large price change events as days on which the market model residuals are greater (less) than 2.5% (-2.5%). Their sample consists of the 200 largest S&P companies and covers the period 1962 to 1985. They find evidence of small, significant positive cumulative returns following both positive and negative events. They attribute this to increases in expected returns following the arrival of unanticipated and substantial news announcements.

Atkins and Dyl (1990) select three NYSE stocks with the largest returns (winners) and three NYSE stocks with the smallest returns (losers) on 300 randomly selected trading days over the period 1975 to 1984. They find that the market overreacts with the 2-day abnormal return being -0.77% for winners and 2.26% for losers. However, the magnitude of overreaction is small relative to the bid-ask spreads for the stocks, and therefore cannot be profitably exploited. They conclude that the market is efficient after taking into account transaction costs.

Bremer and Sweeney (1991) examine Fortune 500 stocks following one day price declines of 10% or more over the period 1962 to 1986. To minimize the effect of the bid-ask spread on returns, they limit their sample to firms which had a stock price of $10 or more on the day preceding the price decline. They also find evidence of overreaction with the 2-day cumulative abnormal return being a statistically significant 2.215%.

Cox and Peterson (1994) examine daily stock returns for NYSE/AMEX/NMS stocks that had a price decline of 10% or more over the period January 1963 through June 1991. Following Bremer and Sweeney (1991), they limit their sample to firms which had a stock price of $10 or more on the day preceding the price decline. Similar to Atkins and Dyl (1990) and Bremer and Sweeney (1991), they find evidence of reversals over 3 days following the event. However, they find that the degree of reversals wanes through time, and these events experience negative cumulative abnormal returns over 4 to 20 days following the event.

Park (1995) constructs a sample of NMS stocks that experience market adjusted abnormal returns of greater (less) than 10% (-10%) over the period October 1984 to January 1987. He finds that restricting the sample to stocks that had a price greater than $10 preceding the event, does not eliminate the bid-ask bounce effect. Using the mid-point of bid-ask prices, he finds that price reversals on day +1 disappear, though they are still present on other days. However, after taking into account the bid-ask spread, he finds that a contrarian investment strategy to exploit the short-run price reversals are not profitable.

Bremer, Hiraki, and Sweeney (1997) examine Japanese stocks for predictable patterns in returns following large price changes. Their sample consists of stocks listed on the Tokyo Stock Exchange and included in the Nikkei 300 index. Using a 10% trigger value to define large price change events, they find little evidence of predictable patterns following large price increases. However, they document significant price reversals following large price decreases. The cumulative abnormal return following large price decreases is 2.17% over days 1 to 3, and 3.44% over days 4 to 20.

In summary, studies which examine price patterns following large one-day price changes have found mixed evidence. Though most of these studies have found evidence of overreaction following large positive and negative one-day price change events, a few have found that the market underreacts to negative price change events. However, most of these studies note that these predictable price patterns are not of economic significance in the face of transaction costs.

The second group consists of studies which examine whether contrarian or momentum investment strategies earn abnormal returns. The construction of the portfolio in these studies is based on the magnitude of past returns of the individual securities which comprise the portfolio. In Lehmann (1990), a portfolio of all stocks on the NYSE and AMEX is constructed based on the returns over the previous week. The portfolio is held for one week after which the portfolio is revised. The weight given to an individual security in the portfolio is proportional to the difference between the past week's return to that security and the past week's return to an equally weighted portfolio of all stocks. He finds that past week's winners earn negative abnormal returns of -0.55% over the following week, and past week's losers earn positive abnormal returns of 1.24% over the following week. Therefore, a zero investment portfolio comprising of a short position in past week's winners and a long position in past week's losers would on average earn a weekly return of 1.79%.

Jegadeesh (1990) ranks securities on the basis of their returns over the previous month. Decile portfolios are formed with each security in the same decile portfolio receiving equal weight. The portfolios are held for one month after which they are revised. He finds evidence of price reversals as the decile portfolio of largest losers earns an abnormal monthly return of 0.96%, while the decile portfolio of largest winners earns abnormal monthly returns of -1.02%.

Jegadeesh and Titman (1993) rank securities based on their returns over the previous 3 to 12 months and form decile portfolios. Each security in the same decile portfolio receives equal weight and the portfolio is held for a period of 3 to 12 months after formation. They find that a zero cost portfolio which is long in the extreme decile winner portfolio and short in the extreme decile loser portfolio earns positive returns over different horizons.

Chan, Jegadeesh and Lakonishok (1996) examine the source of predictability of returns based on momentum strategies. Their results suggest that the predictability of returns is due to market's underreaction to information in both past returns and past earnings.

The contrarian and momentum trading strategies are transaction intensive and so might not be profitable after taking into account transaction costs. Further, the contrarian strategies which rely on short-term price movements, may be a manifestation of the bid-ask bounce effect. Kaul and Nimalendran (1990) find that the main source of price reversals in the short run is the bid-ask spread. They find evidence of positive autocorrelation if security returns are computed using bid prices. Jegadeesh and Titman (1995) present evidence that the short-term reversals can be explained by an inventory based model of the bid-ask spread. They state that the apparent contrarian trading profits documented by Lehmann (1990) and Jegadeesh (1990) are compensation for bearing inventory risk and cannot be realized by traders transacting at the bid and ask prices.

2.2 Precision of information signals

A second characteristic of a signal is its precision. A high precision signal is a signal of high quality or less noise. In a world in which investors use Baye's rule to update their prior beliefs, a high precision signal increases investors' confidence in their private valuations of a risky asset. Also, a high precision signal leads investors to have similar beliefs regarding the value of an asset. Several heterogeneous agent models of trading show how volume captures the level of precision of a signal and the resulting divergence of opinion among agents. Heterogeneity among agents is modeled as agents differing in their beliefs, information sets, or investment opportunities.

In Holthausen and Verrecchia (1990), agents have the same prior distribution and receive information signals with both a common and idiosyncratic component of noise. They therefore interpret information signals differently. The informedness effect measures the extent to which agents become more knowledgeable or confident of their beliefs. The consensus effect measures the extent of agreement among agents at the time of an information release. An increase in informedness results in an increase in variance of price changes and increase in volume. An increase in consensus results in an increase in variance of price changes and a decrease in volume. Therefore, an increase in volume accompanied by a significant price change implies that the informedness effect dominates the consensus effect.

Kim and Verrecchia (1991) develop a model in which traders are diversely informed and differ in the precision of their prior private information. Therefore, they respond differently to the public announcement leading to positive volume. Price change at the time of the announcement is proportional to both the unexpected portion of the announcement and its relative importance across the posterior beliefs of traders. This relative importance is increasing in the precision of the announcement and decreasing in the precision of preannouncement information. Volume is proportional both to price change and to the degree of differential precision.

The models of Holthausen and Verrecchia (1990) and Kim and Verrecchia (1991) state that volume is positively related to the precision of information signals. However, Barron and Karpoff (1997), show that in the face of transaction costs, this relationship is non-monotonic. This is because as a public information signal becomes more precise, it leads to greater consensus among traders thereby reducing the gains from speculative trades. With a positive transaction cost, the gain from each trade is likely to be lower than transaction costs for highly precise signals. Therefore, transaction costs act as a constraint for speculative trades around highly precise public announcements, leading to a negative relation between volume and signal precision.

Kim and Verrecchia (1994) develop a model in which public news can create information asymmetry as certain traders (known as information processors) process public news into private information. This is modeled by assuming that information processors observe an idiosyncratic signal that coincides with the public signal. Their model states that market liquidity will be low with concurrent high price impact costs around a public announcement if it creates information asymmetry and is negatively related to the diversity of opinion among the information processors. Trading volume at the time of the announcement is likely to be high as information processors submit their orders to profit from their private information, and is positively related to the diversity of opinion among information processors.[2] Also, the variance of price changes at the time of the announcement is increasing in the diversity of opinion among information processors.

In Wang (1994), investors are heterogeneous in their information and private investment opportunities and rationally trade for both informational and non-informational reasons. Their model implies that under asymmetric information, investors update their expectations differently when public news arrives. The differential response across investors to public news generates abnormal trading. The greater the information asymmetry among investors, the larger is the abnormal trading when public news arrives.

Harris and Raviv (1993) develop a model in which risk neutral traders trade for speculative reasons. All traders have common priors and receive the same public signal. However, traders are endowed with different likelihood functions. This results in their

[2] Also, discretionary liquidity traders will avoid trading as the market will be less liquid if the announcement creates or exacerbates information asymmetry. Therefore, high volume at the time of the announcement is likely to be generated by the speculative trades of information processors.

interpreting public signals differently which in turn generates speculative trading.

In Kandel and Pearson (1995), agents use different models to interpret public announcements. Similar to Harris and Raviv (1993), this is modeled by assuming that agents are endowed with different likelihood functions. Their model differs from Harris and Raviv (1993) in that agents are risk averse and hold different prior beliefs. Their model also shows that volume is positively related to the diversity of opinion among traders.

Blume, Easley, and O'Hara (1994) present a model in which traders receive signals with differing precision. In their model, volume provides information regarding the quality of the signal. The relationship between volume and signal quality is non-monotonic, with volume reaching its peak at moderate levels of signal quality. Their model suggests a significant relation between lagged volume and current returns. Though they do not predict whether an increase in volume will lead to a price continuation or price reversal, they suggest that traders who use volume in technical analysis will do better than those who don't. They conjecture that volume would be more useful to predict future returns for small stocks, as investors are likely to have noisy priors for these securities.

Thus, precision of a signal can affect the volume. As the precision of a signal increases, it will lead investors to have more confidence in their private valuations of the risky asset and so they will be willing to take large speculative positions. However, it will also lead to a convergence in demand prices as investors are likely to share the same beliefs. This is in turn will lower trading volume, as the potential benefits from speculative positions are likely to be lower than trading costs. On the other hand, if a signal is highly imprecise, it will again lead to low trading volume, because though investors have diverse beliefs they place little confidence in their private valuations and so aren't willing to take large speculative positions. Therefore, volume is likely to be high at moderate levels of signal precision; where investors hold diverse beliefs as well as have enough confidence in their individual valuations to undertake large speculative positions.

Empirically, various studies have shown that volume captures the heterogeneity in beliefs among agents. Most of these studies have focused at volume reactions around earnings announcement. Also, most studies use analyst forecasts of earnings per share (EPS) to proxy for investors' beliefs regarding firm value.

Ziebart (1990) examines the relationship between trading volume and changes in consensus of beliefs among investors around earnings announcements. He uses the standard deviation of analysts' forecasts prior to and following the earnings announcement to proxy for the diversity in investor's prior and posterior beliefs respectively.[3] An earnings announcement is said to create divergence of opinion if the diversity of posterior beliefs is greater than that of prior beliefs. He finds that trading volume is positively related to divergence in analysts' forecasts around earnings announcements.

Ajinkya, Atiase and Gift (1991) investigate the relationship between monthly trading volume and differences in prior beliefs of analysts in general without limiting their study to earnings announcements. They use the monthly revision of mean analysts' forecasts to proxy for the arrival of new information and standard deviation of analysts' forecasts to proxy for differing prior beliefs. They find that the monthly trading volume is positively related to the differences in prior beliefs.

[3] In all of the studies, the standard deviation of analysts' forecasts is standardized by the mean forecast to make the variable scale-free across firms for cross-sectional analysis.

Barron (1995) examines the relationship between monthly trading volume and differential belief revision. Similar to Ajinkya, Atiase and Gift (1991), his study is not limited around earnings announcements. He uses the correlation between the relative positions of individual analysts' current and prior months earnings forecast to proxy for the degree of differential belief revision. He finds that volume is higher when the correlation between analyst' current and prior forecasts is low, suggesting that volume is positively related to the degree of differential revision in investors' beliefs. He also finds that volume is positively related to differences in prior beliefs.

Atiase and Bamber (1994) use standard deviation of analysts' forecasts as well as range across the most optimistic and most pessimistic analyst forecast as proxies for differences in beliefs prior to earnings announcements. They find a positive relationship between trading volume and the two proxies for differences in prior beliefs after controlling for the magnitude of the associated price reaction to the earnings announcement.

Bamber, Barron and Stober (1997) jointly examine the relationship between trading volume around earnings announcements and three distinct aspects of heterogeneity: diversity in prior beliefs, changes in diversity of beliefs, and differential belief revision. They find that volume is positively related to each of the three distinct aspects of heterogeneity.

The theoretical models state that volume generated by speculative trades is related to the precision of information signals. However, volume in the market is generated by both speculative and liquidity traders. Therefore, an increase in volume may occur not because a signal is of moderate precision but because of shocks to the demand of liquidity traders. Campbell, Grossman, and Wang (1993) model increases in volume due to liquidity traders without the release of any new information. Liquidity trades arise due to shifts in the risk aversion of a subset of traders. They investigate the relationship between trading volume and serial correlation in stock returns by modeling the interactions between liquidity traders and risk-averse market makers. In their model, market makers require a higher expected return to accommodate the exogenous selling pressure of liquidity traders. Therefore, price changes accompanied by high volume are more likely to be reversed than are price changes accompanied by low volume.[4] Campbell, Grossman, and Wang (1993) find that the first order correlation of the value-weighted daily stock index returns is lower following high volume days over the period 1962 to 1987. Gagnon and Karoyli (1997) examine the relationship between serial return correlations and volume for the S&P 500 index and the Nikkei 225 index over the period 1974 to 1997. They find that the negative relationship between serial return correlation and lagged volume is significant for the S&P 500 index only prior to the October 87 crash period. For the Nikkei 225 index , the relationship is not significant prior to or following October 87.

Conrad, Hameed, and Niden (1994) examine the relationship between volume and subsequent weekly returns for individual stocks as opposed to an index. Their sample consists of NMS stocks over the period 1983 to 1990. Using number of trades to proxy for volume, they find evidence of price reversals following volume increases in accordance

[4] Wang (1994) finds a similar result if traders are symmetrically informed.

with the Campbell, Grossman, and Wang (1993) model.[5] They also find evidence of price continuations for low volume stocks. The significant relation between lagged volume and current returns for low-volume stocks is more pronounced for small firms, consistent with the Blume, Easley and O'Hara (1994) model.

Cooper (1998) uses filter rules on lagged return and lagged volume to uncover predictable price patterns at weekly horizons for large capitalization NYSE/AMEX stocks. He finds that that high growth in volume stocks experience weaker reversals relative to low growth in volume stocks, and at times even experience price continuations.

Lee and Swaminathan (1998) examine the interaction between price momentum and past trading volume for NYSE/AMEX stocks. They find that past trading volume predicts both the magnitude and persistence of future price momentum. Over intermediate horizons of 3 to 12 months, a strategy of buying past high-volume winners and selling past high-volume losers outperforms the traditional price momentum strategy of buying winners and selling losers by 2% to 7% per year.

The empirical studies do not try to distinguish volume generated by speculative trades from volume generated by liquidity traders. This could be important as volume generated by liquidity traders is not related to signal precision. Therefore, using volume per se is a noisy proxy for signal precision. Also, it is possible that speculative and liquidity trades affect future prices in opposite directions. Campbell, Grossman and

[5] Price reversals following high volume due to liquidity traders as in Campbell, Grossman, and Wang (1993) is also consistent with the price pressure hypothesis. If the short-term demand of a stock is not perfectly elastic, and the long-term demand is perfectly elastic, then investors who accommodate the demand shifts are compensated by immediate price drops (rises) associated with large sales (purchases) which are reversed when prices reach their full information levels. Harris and Gurel (1996) find that the initial price reaction to the announcement of a firm's inclusion in the S&P 500 is due to price pressure as it is subsequently reversed.

Wang (1993) show that an increase in volume due to liquidity trades will result in price reversals. On the other hand, though Blume, Easley, and O'Hara (1994) don't state whether an increase in volume will result in price continuations or price reversals, price continuations cannot be ruled out. Previous empirical studies fail to account for this distinction and so have limited power to detect the ability of volume to predict future returns.[6]

2.3 Dissemination of information signals

A third characteristic of a signal is its level of dissemination. Dissemination refers to the fraction of traders that receive the signal. Blume, Easley and O'Hara (1994) state that for signals of the same precision, the greater the dissemination of information, the smaller will be the volume because with greater dissemination there will be a smaller divergence of opinion. Since public announcements generate the greatest amount of dissemination, a volume increase around a public announcement is less likely due to a low level of dissemination and more likely due to imprecision of the signal.

Market reaction to public announcements has been researched at several levels. At an aggregate level, Mitchell and Mulherin (1994) examine the relationship between amount of information that is publicly reported and market activity. They study the effect of news measured by number of stories or size of headlines on measures of market

[6] For example, assume that an increase in volume due to liquidity trading will result in a price reversal of 1% on the following day, and that an increase in volume due to speculative trading will result in a price continuation of 1% on the following day. Further, assume that in a sample of events which experience an increase in volume, half of the sample experienced an increase in volume due to liquidity trading and the other half due to speculative trading. Now if we calculate abnormal returns for day 1 for the entire sample it will be zero. However, if we divide the samples based on whether the increase in volume was driven by liquidity or speculative trades, we would uncover the price continuation and price reversal of 1% for the subsamples.

activity such as trading volume, the absolute value of market returns, and the sum of the absolute value of firm-specific returns. Though they find evidence that public information is related to market activity, the observed relationship is weak.

Schwert (1981) studies the effect of macroeconomic announcements, such as information about inflation, on the Standard and Poor's composite index. He finds a negative but weak relationship between aggregate stock returns and unexpected inflation. Also, the market takes several days following the announcement to react to the information. However, the magnitude of delayed reaction is too small to be profitably exploited.

At a firm level, Roll (1988) examines whether firm-specific public news events can explain the returns on large stocks. He finds that the ability of the single-factor CAPM or multiple-factor APT to explain the variability in stock returns improves only marginally if firms which have firm-specific news releases are excluded from the analysis. This suggests that stories from the financial press have little effect on the returns of large stocks.

In addition to capturing the level of dissemination of an information signal, the type of public announcement is also likely to be related to the precision of the signal. For example, legal and legislative announcements are likely to be high precision signals as they resolve some underlying uncertainty regarding firm value. Similarly, merger announcements are likely to reduce uncertainty regarding the value of target firms. On the other hand, earnings announcements are likely to be signals of moderate precision as agents hold different beliefs regarding the temporary and permanent component of earnings.

Studies which examine the price discovery process around the type of the announcement have found evidence of return regularities. The most well-known price continuation is the post-earnings announcement drift (see Jones and Litzenberger, 1970; Rendleman, Jones, and Latane, 1982; and Bernard and Thomas, 1989). Repeated attempts to explain the drift have failed. The post-earnings announcement drift is not small: Bernard and Thomas (1989) find that firms with surprisingly good earnings earn 20-day post-event abnormal returns of approximately 1% which increases to 2% over a 60-day period. The magnitude of drift is similar for firms with surprisingly bad earnings: they lose about 1% in the 20 days following the announcement which increases to approximately 2% over a 60-day period. However, the magnitude of underreaction is larger for small firms. This suggests that a trading strategy designed to exploit this market efficiency is likely to be unprofitable in the face of transaction costs, especially over a 20-day period.

In addition to the earnings drift, McNichols (1989) finds that stock prices underreact to management earnings forecasts. The cumulative abnormal return over 120 days following the event is –3.52% if management's earnings forecast is below analysts' earnings forecasts. However, there is no underreaction if management's earnings forecast exceeds analyst's earnings forecasts.[7] On the other hand, Waymire (1984) finds evidence of overreaction if management's earnings forecasts exceed analysts' forecasts: the cumulative abnormal return is –2.11% over 100 days following the announcement. For management's earnings forecasts that are below those of analysts, he does not find

[7] McNichols (1989) requires firms to have a stock price greater than $10 preceding the event. Therefore, it is likely that a significant portion of her sample consists of large firms. As she uses the market model to calculate abnormal returns and therefore controls only for beta risk, the negative abnormal returns observed in her study are likely to be biased.

evidence of significant post-event abnormal returns.

Ikenberry, Lakonishok, and Vermaelen (1995) find that stock prices underreact to open market share repurchase announcements to the extent of about 2% over the following year. Michaely, Thaler, and Womack (1995) present evidence of underreaction to dividend initiations and dividend omissions. Firms initiating (omitting) dividends earn abnormal returns of 1.8% (-4.6%) over approximately 60 days following the event. Womack (1996) finds that stock prices underreact to analyst recommendations. Buy recommendations are followed by a one-month drift of +2.4% while sell recommendations are followed by a six-month drift of –9.1%.

Finally, Barber and Loeffler (1993) analyze the effect of analyst recommendations published in the monthly "Dartboard" column of the Wall Street Journal. They find evidence for the price pressure hypothesis as half of the initial price response is reversed within the subsequent 25 days. The magnitude of reversal is larger for firms that had abnormally high trading volume on the publication day. However, Albert and Smaby (1996) report that the reversals are due to a biased benchmark when a pre-event estimation period is used to calculate the market model parameters. They don't find evidence of significant price reversals if a post-event estimation period is used or if size-adjusted returns are used as the benchmark.

To summarize, each of the three information proxies used in the literature has some power to predict future returns. However, most of this predictable behavior is not of economic significance over short horizons.

CHAPTER 3

TESTING FOR RETURN PREDICTABILITY

We test whether simultaneously conditioning on the multidimensional characteristics of information signals can help improve return predictability. We start with a sample of large positive and negative one-day price change events. We test whether the market reaction to these events is unbiased by examining the abnormal returns over 20 days following the event. The hypothesis is stated below. A rejection of the null hypothesis would indicate that the market reaction to large price change events is biased in that it leads to predictable price patterns. Therefore, a rejection of the null hypothesis indicates that the magnitude of information signals helps predict future returns.

Hypothesis One: *Abnormal returns following large price change events are zero.*

Next we examine whether jointly conditioning on the magnitude and dissemination of information signals can help predict future returns. Public announcements are information signals received by investors at large and represent events which have a high level of dissemination. Therefore, we divide our sample of positive and negative price change events based on whether or not the events were accompanied by a public announcement. The average level of dissemination for large price change events accompanied by a public announcement will be much higher than that for large price change events not accompanied by a public announcement. Examining post-event abnormal returns for each of these samples will help discern the joint ability of magnitude and dissemination to predict future returns. A rejection of the null hypothesis stated below would indicate that jointly conditioning on the magnitude and dissemination of information signals can help predict future returns.

<u>*Hypothesis Two:*</u> *Large price change events earn zero post-event abnormal returns whether or not they are accompanied by a public announcement.*

Finally, we test whether jointly conditioning on the magnitude, dissemination, and precision of information signals can help predict future returns. We use trading volume to proxy for the level of precision of information signals, with an increase in volume suggesting that the information signal is of moderate precision. As stated earlier, volume per se is a noisy measure for information precision as volume in the market is generated by speculative as well as liquidity traders. Therefore, we need to identify whether a given change in volume for a security is due to speculative trading or liquidity trading.

To deal with this issue, we standardize volume for a given security by the aggregate market volume so that a change in volume is not observed due to a change in the market's overall trading volume. In addition to standardizing the volume statistic by the aggregate market volume, we separate volume increase events due to liquidity traders from those due to speculative traders by relying on whether or not a public announcement accompanied the increase in volume. An increase in volume accompanied by a public announcement is likely due to speculative trades by diversely informed traders. Empirical findings support the reasoning that public announcements generate information asymmetry, and that volume around public announcements is likely to be generated by the speculative trades of diversely informed investors. Krinsky and Lee (1996) find that the adverse selection component of the bid-ask spread increases significantly around earnings announcement. Kandel and Pearson (1995) find evidence of positive abnormal trading volumes around quarterly earnings announcements that did not result in a price change. They state that this is inconsistent with most existing models of trade which assume identical interpretations of public signals.[8] Kim and Verrecchia (1994) state that discretionary liquidity traders will avoid trading if a public announcement creates or exacerbates information asymmetry. As a result, an increase in volume at the time of a public announcement is likely to be generated by the speculative trades of information processors.

Therefore, for large price change events accompanied by a public announcement, trading volume is likely to be generated by speculative traders and so serves as a good proxy for the level of precision of the information signal. On the other hand, for large price change events not accompanied by a public announcement, volume serves as a noisy proxy for the level of precision of information signals for two reasons. First, volume for each event in this sample is likely to be generated by liquidity traders and liquidity trades do not convey information about signal quality. Second, the level of dissemination is not likely to be the same for each event in this sample. As the level of dissemination affects trading volume, we cannot discern whether an increase in volume is due to an imprecise signal or whether it is due to a low level of dissemination. However, even though volume

[8] They also find that the manner in which analysts revise their forecasts around quarterly earnings' announcements is inconsistent with the assumption of identical interpretations of public signals.

is a noisy proxy for signal precision for large price change events not accompanied by a public announcement, it might still have some power to predict future returns. The hypothesis can be stated as follows:

<u>*Hypothesis Three:*</u> *Large price change events accompanied by a public announcement as well as large price change events not accompanied by a public announcement earn zero post-event abnormal returns whether or not trading volume increased on the event day.*

A rejection of the null hypothesis would indicate that simultaneously conditioning on the magnitude, dissemination, and precision of information signals can help predict future returns.

CHAPTER 4

DATA AND SAMPLE

Our sample construction begins with all common stocks listed on the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) for which data is available in the 1990-1992 transactions file of the Institute for the Study of Security Markets (ISSM). We exclude ADRs and closed-end funds because public announcements regarding ADRs are more difficult to obtain and because closed-end funds are derived from individual stocks.[9] A daily stock return that represents a large abnormal price change is called an event. A change is said to be large if the abnormal return after adjusting for the value-weighted CRSP NYSE/AMEX index is more than three standard deviations away from the mean, based on mean and standard deviation calculated over the preceding 250 trading days for that firm.[10]

Since previous studies have found evidence of market microstructure effects contributing to the observed predictable pattern of prices, we try to avoid such biases. In particular, a potential source for the predictable pattern in prices is the bid-ask bounce effect. Even after excluding below $10 price stocks, prior studies find that the reversals can, in part, be attributed to the bid-ask bounce effect (see Cox and Peterson, 1994; and Park, 1995). Another potential source for the predictable pattern in prices is infrequent trading, which could lead the observed stock price to adjust slowly to new information

[9] We also exclude Berkshire Hathaway and Capital Cities because of their high stock prices and spreads.
[10] A minimum of 240 non-missing observations is required to calculate the mean and standard deviation.

resulting in underreaction.

With these issues in mind, returns are calculated at mid-point of closing bid-ask prices.[11] The bid-ask prices are obtained from ISSM data. Missing and erroneous ISSM prices are replaced with CRSP closing prices (0.2% of the sample).[12]

The events are restricted to lie on or between Jan 1, 1990 and Dec 2, 1992. The last 20 trading days of 1992 are reserved for examining the post-event price discovery process. This criterion generates a sample of 23,459 events with large abnormal price changes.

A second screen requires the firm not to have a large abnormal price change over the preceding 20 trading days. We impose this criterion to ensure that we do not include multiple events in the same time period for the same firm. This reduces the sample to 13,130 events. To ensure that increases in volume are not spuriously caused by a change in number of shares outstanding, we exclude events for which the firm experienced a change in shares outstanding, as reported in CRSP files, of greater than 1% on the event day or the preceding 60 trading days.[13] This reduces our sample to 10,689 events.

Considering the market microstructure issues discussed above, we impose two additional screens. First, we exclude all events where the firm had a closing price of less then $10 on the event date. Low stock prices usually have higher percentage effective bid-ask spreads. Therefore, it is likely that all relevant information is not incorporated in

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[11] Adjustment for dividends and stock splits is made with the following factor: Ret(t) - [(P(t) - P(t-1))/P(t-1)], where Ret(t) is the CRSP holding period return on day t, P(t) and P(t-1) are the CRSP closing prices on day t and t-1 respectively.

[12] If the midpoint of the bid-ask prices differs from the CRSP closing price by more than $2, then the price is considered to be in error.

[13] To guard against any misreporting in the number of shares outstanding, we exclude events where a stock split, stock dividend, or an equity issue was made over the prior 60-day period.

prices on Day 0 for these stocks because the marginal cost of trading may exceed the marginal benefit. This reduces our sample to 6,127 events.[14] Second, we require the firms to be traded on each of the 60 days preceding the event date. This screen ensures that infrequently traded stocks with the attendant problem of high autocorrelation are not included in the sample. This reduces our sample to 4,886 events.

Finally, we exclude firms that are in the bottom size quintile relative to the universe of NYSE/AMEX stocks. This screen is required to obtain an adequate number of size-matched control firms to bootstrap for computation of abnormal returns. In any case, there is a reduction of only 13 events to a final sample of 4,873 events.

The sample is divided into positive and negative events depending on whether the event day market adjusted abnormal return is positive or negative. Table 4.1 provides some characteristics of the sample. Of the 4,873 events, the return is significantly positive for 2,919 and significantly negative for 1,954 events. The positive events sample and the negative events sample are quite similar in firm size and magnitude and distribution of abnormal returns. Table 4.1 shows that firms in our sample are not small. The median firm's market value is almost $1 billion, the stock price is over $25, and it is in the second largest size quintile of NYSE/AMEX universe of firms. With the last screen in place, we have no stocks that lie in the bottom quintile of NYSE/AMEX stocks. Therefore, it is unlikely that small firms drive the results in this paper. Table 4.2 shows the frequency

[14] As this criteria is imposed following the price change, it will result in a larger number of negative price changes being excluded relative to positive price changes. An alternative would be to impose this criteria before the price change. However, this would lead us to include in our sample negative price change events with a closing price on the event day of less than $10, resulting in these stocks having potentially high effective bid -ask spreads. Therefore, we believe it is appropriate to impose this criteria following the price change. Anyway, imposing this criteria following the price change does not introduce any bias in the post-event returns.

distribution of events. There is not much evidence of event clustering and so it is unlikely that the post-event returns for the sample firms will be correlated with each other. In any case, as discussed in the next chapter, we use bootstrapping methodology to calculate post-event abnormal returns and measure their statistical significance which will take into account any associated dependencies in the post-event returns.

Table 4.1

Sample Characteristics

	Positive Events					Negative Events				
Sample Size	2919					1954				
	Mean	Quartile 1	Median	Quartile3	Std Dev	Mean	Quartile 1	Median	Quartile3	Std Dev
ABNORMAL RETURN (%)	7.13	4.79	6.27	8.31	4.17	-7.13	-8.31	-6.12	-4.60	4.10
PRICE	30.86	17.06	25.75	38.44	21.02	31.10	17.86	26.25	37.88	19.47
FIRM SIZE (in $ billions)	2.23	0.28	0.79	2.17	5.04	3.13	0.38	0.99	2.80	7.03
SIZE QUINTILE	4.04	3	4	5	0.91	4.18	4	4	5	0.85

ABNORMAL RETURN is the market adjusted abnormal return for the sample firm (adjusted for the value weighted CRSP NYSE/AMEX index).
PRICE is the midpoint of the closing bid-ask prices on day 0.
FIRM SIZE is the size of the firm at the beginning of the year.
SIZE QUINTILE are formed based on the universe of NYSE/AMEX firms at the beginning of the year. Size quintile 1 represents the smallest firms and size quintile 5 represents the largest firms.

Table 4.2

Frequency Distribution of Events

The 2919 positive events and 1954 negative events lie between Jan 1, 1990 and Dec 2, 1992. There are 740 trading days in this period. The frequency of the events are shown at intervals of one, five, ten and twenty days.

	Positive Events						
Frequency Interval	Mean	Min	Quartile 1	Median	Quartile3	Max	Std Dev
1 day	3.94	0	2	3	5	38	3.79
5 days	19.72	0	12.5	18	23	67	11.54
10 days	39.45	11	26	37.5	47	129	19.96
20 days	78.89	31	62	72	91	236	35.39

	Negative Events						
Frequency Interval	Mean	Min	Quartile 1	Median	Quartile3	Max	Std Dev
1 day	2.64	0	1	2	4	30	2.91
5 days	13.20	2	8	11	16	78	9.04
10 days	26.41	9	18	22.5	32	104	15.14
20 days	52.81	22	36	48	58	142	24.27

CHAPTER 5

POST-EVENT ABNORMAL RETURNS AND SIGNAL CHARACTERISTICS

In this chapter, we examine whether conditioning on the three signal identifying proxies can help improve return predictability. As our objective is to uncover predictable price patterns that are of economic significance, it is important that our measure of abnormal returns be both easy to interpret economically and be attainable at reasonable transaction costs. We therefore calculate buy and hold abnormal returns as opposed to cumulative abnormal returns, as the latter assumes daily rebalancing and so does not represent a realistic investment strategy.

5.1 Measuring post-event abnormal returns

To measure abnormal returns, buy and hold returns for an equally weighted portfolio of sample firms are computed for up to 20 days following an event. Post-event abnormal returns and their statistical significance are calculated using bootstrapping methodology. The abnormal return is the buy and hold return less the average return to a control portfolio formed by bootstrapping. The return to a control portfolio is calculated as follows: For each sample firm in our portfolio, a control firm in the same size quintile is randomly selected with replacement.[15] Size quintiles are determined at the beginning of the year, and are based on market equity value relative to the universe of all

[15] Control firms are not limited to non-event firms. For example, if our sample portfolio has 4 firms, say A, B, C, and D, then firms B, C, and D can also serve as a control firm for sample firm A.

NYSE/AMEX common stocks. Other relevant screens applied to the sample firm are also applied to the control firm. These include the 250-day listing requirement, a minimum $10 price, and positive trading volume on each of the 60 days preceding the event date.[16] The control portfolio selection process is repeated 1,000 times to generate an empirical distribution of control portfolio returns. The abnormal returns are considered to be statistically significantly positive (negative) at the α % level if the sample portfolio return is greater (less) than the 1-α_{th} (α_{th}) percentile return of the bootstrapped control portfolio return distribution.

We also calculate the buy and hold abnormal return for each firm and test whether the proportion of firms (PRO) in the sample portfolio which have positive abnormal returns is significantly different from 0.50. The buy and hold abnormal return for a firm is measured as the raw return less the average return to a control firm formed by bootstrapping. To test whether PRO is statistically significantly different from 0.50, we use a normal approximation and calculate the following z-statistic where N is the number of observations:

$$z - statistic = \frac{PRO - 0.50}{\sqrt{0.25 / N}}$$

5.2 Large price changes

The buy and hold abnormal returns to an equally weighted portfolio of the sample of large price change events are presented in Table 5.1. The results indicate that there is a significant amount of information leakage for the negative events sample as the abnormal

[16] After imposing these criteria, on average there are 51, 179, 315, and 397 firms that can serve as a control firm for events in size quintiles 2, 3, 4, and 5 respectively.

return over 5 days preceding the event is a statistically significant -0.96%. For the positive events sample, there does not appear to have been any leakage of information. The evidence reveals that the market underreacts to large price change events: stock returns are abnormal for the day following the event, though the return is economically small. Over a holding period of 20 days, the abnormal return is statistically insignificant for the positive events sample. For the negative events sample, the 20-day abnormal return of -0.48% is statistically significant. For NYSE-AMEX stocks, Chalmers and Kadlec (1998) estimate the round-trip transaction cost at 0.50% for stocks with the smallest effective spread. Similarly, Knez and Ready (1997)'s estimate is 0.58% for the large NYSE stocks. Based on these estimates of transaction costs, the abnormal return of –0.48% does not seem economically important. Further, there is no consistent pattern in the days following the announcement, except on Day 1. The results are similar to those found by Park (1995) who finds that predictable patterns in prices following large price change events cannot be profitably exploited. Therefore, though the magnitude of information signals in itself helps predict future returns, it is not of economic significance.

5.3 Public announcements

Public announcements release new information that is disseminated broadly among investors. The literature related to price continuations or price reversals around public announcements suggests that release of news is an important determinant of return predictability (for example, see Bernard, 1992; Ikenberry et al., 1995; Michaely, et al., 1995; and Womack, 1996). Therefore, we test whether conditioning on both large price changes and public announcements helps predict future returns. For each event date, we search for news reports. In Table 5.2 the events are categorized based on whether a news item related to the company was reported in the Wall Street Journal or on the Dow Jones News Wire.[17] Approximately, one-third of the events had public announcements. The non-availability of public announcements for the remaining events may be due to non reporting of news related to small firms, or the large price change may have been caused by several other factors such as significant changes in macroeconomic or industry-wide factors, communication between financial analysts or advisors and their clients that is not made public, or trading by agents based on their private information. Finally, the large price changes may not be due to new information; they could occur through liquidity trades. For the negative events, the abnormal return over 5 days preceding the event is much higher at -1.27% if the event was not accompanied by a public announcement relative to -0.53% if the event was accompanied by a public announcement. This suggests that for the negative events, leakage of information is more prevalent if there is no news on the event day. However, the same cannot be said of the positive events.

Table 5.2 reveals that events accompanied by public release of new information underreact to new information, whereas events not accompanied by a public announcement do not underreact. The positive events are followed by a statistically significant return of 1.25% over a 20-day period if there was a public announcement. In the absence of a public announcement, there is a slight reversal with an abnormal return of -0.39%. Similarly, negative events with a public announcement are followed by a statistically significant abnormal return of -1.62% over a 20-day period. A significant 55%

[17] The announcement is assumed to occur on the event day if it occurs any time between the stock market close of the preceding trading day and the close of the event day.

of the negative events not accompanied by a public announcement experience reversals though the average abnormal return is an insignificant 0.32%. Looking at the results another way, the last statistically significant returns occurs during the Day 16-20 period for the positive events with a public announcement and during the Day 11-15 period for the negative events with a public announcement. For no news events, the last statistically significant return is in the Day 1-5 period for both positive and negative events.

It is generally expected that private information will take longer to be reflected in prices than public information as the latter is immediately available to all traders and investors. Since this does not seem to have occurred in the "no public news" sample, it appears that the large price change probably occurred due to liquidity trades. The difference in post-event abnormal returns between the "public news" and "no public news" samples implies that jointly conditioning on the magnitude and dispersion of information signals improves return predictability. Further, the evidence of price continuation following large price changes accompanied by public announcements has not been previously reported in the literature. Previous studies have considered only selected types of announcements as we do later.

5.4 Volume increases

Finally, we test whether simultaneously conditioning on the magnitude, dissemination and precision of information signals helps predict future returns. Several heterogeneous agent models of competitive trading show that volume captures the precision of information signals, with volume peaking at moderate levels of information precision. The models of Kim and Verrecchia (1994) and Kandel and Pearson (1995) suggest that if traders interpret information differently, the public announcement might exacerbate information asymmetry instead of reducing information asymmetry. In addition to an increase in information asymmetry, these models predict an increase in trading volume as information processors submit their orders to profit from their private information.

Besides information asymmetry, increases in volume may also occur due to liquidity trading (Campbell, Grossman, and Wang, 1993), and due to portfolio rebalancing around large price changes (Karpoff, 1987). Campbell, Grossman, and Wang (1993) reason that volume increases due to liquidity trading would result in price reversals. Portfolio rebalancing around large price changes could cause price pressure leading to subsequent price reversals.

On the other hand, information asymmetry can result in price continuations. Kyle (1985) develops a model in which a monopolistically informed trader trades in such a way that his private information is gradually revealed over time. Foster and Vishwanathan (1996) consider strategic trading given more than one informed trader who have differential private information. Under this scenario, as the correlation between the private signals of the informed traders decreases, it reduces the degree of competition between traders and they trade less aggressively. Therefore, the lower the correlation between the private signals of informed traders, the more time it takes for private information to be incorporated into prices. Though the theoretical models don't state that slow incorporation of information in prices will result in price continuations, empirical findings indicate that this is indeed the case. Chan and Lakonishok (1995) find that institutions trade strategically by breaking up their trade orders, and this results in price continuations.

In view of the above, we subdivide the samples based on whether the event was accompanied by an increase in volume on the event day. To be included in the “increased volume” subsample, the firm's volume standardized by the aggregate NYSE/AMEX market volume should be greater than the 90th percentile of the volume distribution over the preceding 60 days.[18] We standardize volume by the aggregate market volume, so that a significant change in volume is not observed due to a change in the market's overall trading volume.

As would be expected, Table 5.3 shows that volume increases are more common for events accompanied by a public release of news than for other events: nearly 75% of public announcement events experience an increase in volume compared with less than 45% for the “no public news” events. For both positive and negative events accompanied by a public announcement, there is evidence of information leakage if the volume increased on the event day, suggesting that information processors are active in these samples. Conditional on volume increases and public announcements, positive events are followed by a statistically significant abnormal return of 1.98% and negative events are followed by a statistically significant abnormal return of -1.68% over a 20-day period. The percent of firms with positive abnormal returns confirms this observation: 58% of the positive events have positive abnormal returns and 58% of the negative events have negative abnormal returns.

There is some support for the Campbell, Grossman, and Wang (1993) model. Events where volume increased but were unaccompanied by a public announcement

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[18] The results are similar if a higher cutoff is used. A lower cutoff will make the "no volume increase" sample too small.

exhibit some tendency towards price reversals. In the positive events sample, the proportion of firms earning positive abnormal returns during the 20-day period is 49%, and for the negative events sample, the proportion of firms earning negative abnormal returns is 46%. The different price patterns for the "volume increase" category depending on whether or not there was a public news on the event day highlights the importance of trying to distinguish between volume generated by speculative traders from volume generated by liquidity traders.

Table 5.3 also shows that for the positive events, there is no significant underreaction in any of the other categories; though there is an overreaction for the "no public announcement" and "no increase in volume" category. The categorization by volume is less discriminatory for the negative events sample. Negative events accompanied by a public announcement earn statistically significant abnormal returns of -1.68% over a 20-day period if volume increased, and -1.34% over a 20-day period if volume did not increase.[19]

5.5 Regression analysis

In this section, we use regression analysis to examine the relative importance of information signal characteristics in predicting the drift in returns by estimating the following equation (1):

$$BHARET_i = \alpha + \beta_1 DAY0_i + \beta_2 PUBANN_i + \beta_3 LOGABVOL_i + \varepsilon_i \qquad (1)$$

[19] It would be interesting to examine whether the magnitude of drift is larger for young firms as they have lower levels of institutional ownership and analyst following and so news regarding these firms is likely to be disseminated slowly. However, our sample is not appropriate to examine this issue as more than 90% of our sample firms are at least 5 years old.

where BHARET is the 20-day buy and hold abnormal return for the sample firm, DAY0 is the abnormal return on day 0, PUBANN is a dummy variable equal to 1 if the sample firm had a public announcement, and LOGABVOL is the log of the ratio of the standardized volume on day 0 divided by the median standardized volume over 60 days preceding the event.

The results presented in Table 5.4 indicate that the magnitude of underreaction is larger if the positive event is accompanied by a public announcement and higher volume. For negative events, the magnitude of underreaction is larger if the firm had a public announcement, however event day volume is not related with the magnitude of underreaction. As our sample consists of large price change events, there is not much cross-sectional variation in the DAY0 variable and it is not surprising that its coefficient is not significant for the negative events sample. Surprisingly, for the positive event sample we observe a statistically significant negative coefficient, indicating that conditional on a large price change, the magnitude of underreaction is larger if the event day abnormal return is small. As the results in Table 5.1 suggest that there is leakage of information prior to the negative events, DAY0 variable is likely to underestimate the magnitude of the signal for the negative events. Therefore, we re-estimate equation 1 using the abnormal return from 5 days prior to the event day (BHARET[-5,0]) as a proxy for the magnitude of the information signal. The results with this new proxy for the magnitude of the signal, also reported in Table 5.4, remain unchanged.

Overall, the results suggest that conditioning on all three signal identifying proxies simultaneously helps predict future returns. The statistically significant positive coefficient for event day volume in the positive events sample is consistent with information asymmetry models such as Kyle (1985) and Foster and Vishwanathan (1996) that suggest strategic trading by informed investors. However, the insignificant coefficient for the negative events sample is not consistent with those models. While we examine consistency with the information asymmetry models in greater detail in Chapter 6, one reason for the volume coefficient to be significant for positive events but not for negative events could be that informed traders are more willing to take long positions rather than short positions in stocks. Also, short selling is possible only in very liquid stocks. Therefore, while a volume increase can take place for all positive events, it may not occur for all negative events. Accordingly, the "no volume increase" sample of negative events may include many events where there was a significant increase in information asymmetry without a corresponding increase in volume.

5.6 Testing for bias in abnormal returns

We have found that return predictability is greater in the presence of a public announcement and with an increase in volume. However, our results are based on the assumption that a size control portfolio is the appropriate benchmark to use to measure abnormal returns. If this is not the case, then our measure of abnormal returns is potentially biased. As we use matched control portfolio method to estimate the abnormal returns, we have controlled for the various risk factors that affect stock returns. However, if the loading of our sample firms on these risk factors differs from those of the matched firms, then our measure of abnormal returns is biased. Our sample firms and their matched control firms will have the same loading on the risk factor associated with firm size, but the loadings could differ for the other risk factors.

To examine this issue, we test whether one potential risk factor (i.e. the factor associated with the market return) could explain our results. Specifically, we examine whether the loading on the market return (i.e. beta) for our sample firms differs from those of the matched firms. The bias in the abnormal return over 20 days following the event is the beta bias multiplied by the excess market return over 20 days following the event as shown in equation 2:

$$\text{Abnormal return bias} = (\beta_{sample} - \beta_{control})(R_m - R_f) \qquad (2)$$

We calculate the betas for the sample as well as control firms using daily data over 250 trading days preceding the event. We use the daily compounded CRSP value-weighted index return over 20 days following the event to measure R_m and assume the risk-free rate over 20 days is 0.30%.

Table 5.5 and Table 5.6 presents the results for the potential bias in the 20-day post-event abnormal returns for various samples. The results indicate that the potential bias due to mis-estimation of beta risk is small. For example, we find statistically significant 20-day abnormal returns of 1.98% and -1.68% for positive and negative events respectively if they are accompanied by a public announcement and an increase in volume. Table 5.5 shows that the abnormal return bias is 0.01% and 0.20% for these subsamples. After correcting for this bias, the abnormal returns for the positive events decreases to 1.97% but is much higher at –1.88% for the negative events. In the same vein, for positive events accompanied by a public announcement, the 20-day abnormal return is 1.98% if volume increased on the event day and -0.58% otherwise. Table 5.6 shows that the abnormal return bias is 0.01% and –0.06% for these subsamples. After correcting for this bias, the abnormal returns decrease to 1.97% and –0.52%. The largest magnitude of bias among the various positive (negative) subsamples is 0.20% (-0.20%) over a 20-day period. This is small relative to the magnitude of drift observed for various subsamples, suggesting that mis-estimation of beta risk cannot explain a significant portion of the observed abnormal returns.

5.7 Abnormal returns and the type of announcement

A few sections back, we noted that the magnitude of underreaction is greater in the presence of a public announcement and an increase in volume. Prior work has found evidence of price continuation for certain kinds of events: earnings announcements, dividend omissions and initiations, stock repurchases, and analyst recommendations. Taking cognizance of this evidence, we divide the public announcement sample into several subsamples based on the type of news. Construction of subsamples is dictated by similarity of news and the resulting size of each subsample. The seven distinct types of announcements are listed in Table 5.7. Whenever a news could fall into several categories, precedence is given in the following order: mergers and acquisitions, earnings announcement, earnings forecasts, other restructuring related information, capital structure related information, analyst recommendations, and general business related information respectively.[20] For example, analysts frequently upgrade or downgrade stocks immediately following an earnings announcement. In such cases, the event is characterized by a Type 1 announcement (earnings). The sizes of the positive and

[20] If an earnings announcement (Type 1) is accompanied by a stock split (Type 4), it is likely that the large price change is due to the stock split and so the event should be classified as Type 4. There is one event in our sample where an earnings announcement is accompanied by a stock split. The earnings was below analyst' expectations but the company also announced a stock split. As the event is negative, the price change is driven primarily by the bad earnings announcement and so the event is classified as Type 1.

negative event subsamples are similar except for types 2 and 5 (see Tables 5.8 and 5.9). There are only 27 type 2 positive events compared to 132 type 2 negative events. The difference seems to suggest that the management pre-announces underperformance more frequently than overperformance. For type 5, there are 177 positive events but only 73 negative events reflecting the fact that restructuring announcements are usually big positive events for target firms.

Among the different categories, news of types 1, 2, 3 and to some extent 4 are likely to information signals of moderate precision and are likely to exacerbate information asymmetry instead of reducing it. For example, investors are likely to hold different beliefs regarding the temporary and permanent component of earnings and so there will be much ambiguity about how current earnings are related to future earnings around earnings announcements. Analyst recommendations are usually accompanied by their estimates of future earnings and so are likely to exacerbate information asymmetry. On the other hand, a large proportion of news of types 5, 6, and 7 are likely to be highly precise signals as they are likely to resolve some underlying uncertainty regarding firm value. For example, there is comparatively little ambiguity regarding valuation of target firms in the case of mergers and acquisitions. Legal and legislative announcements are likely to resolve some uncertainty regarding the environment in which the firm operates. Therefore, if strategic trading under information asymmetry is the cause for price continuations, the magnitude of underreaction should be larger for earnings related announcements and analyst expectations, i.e. announcements of types 1, 2, and 3 than for other announcements. From an information asymmetry perspective, this expectation is supported by Krinsky and Lee (1996) who find a significant increase in the adverse selection component of the spread around earnings announcements.

Barberis, Shleifer, and Vishny (1998) propose a competing hypothesis. According to their investor sentiment hypothesis, investors are slow to revise their beliefs. Any new information has a temporary and permanent component. When the information is not consistent with their priors, investors overestimate the random component of information and underestimate the permanent component. With passage of time and with more information, they gradually alter their beliefs implying that prices take longer to react because of investor resistance to new information. The investor sentiment hypothesis does not require information asymmetry, just that investors form prior beliefs and that there is room for underestimating the impact of news.

Among the different news types and from an investor sentiment perspective, investors can form and update beliefs around earnings, analyst recommendations, and dividends. Further these are the only new information events where investors use current information to obtain future estimates. Analyst recommendations can cause revision of beliefs as analyst recommendations are usually accompanied by their estimates regarding the firm's future earnings. Therefore, types 1, 2, 3, and part of type 4 are candidates for price continuations as per the investor sentiment hypothesis.

Table 5.8 contains results for positive events based on the type of announcement. As the raw returns do not provide further information and in order to conserve space, we exclude raw returns from subsequent tables. Instead, we report whether the abnormal returns for the samples is significantly different from one another. To test for the difference between portfolios A and B, we bootstrap control portfolio A and control portfolio B and take the difference of their returns. We repeat this process 1000 times to generate an empirical distribution of the difference in returns between control portfolio A and control portfolio B. The abnormal return to sample portfolio A is statistically significantly greater (less) than the abnormal return to sample portfolio B at the α % level, if the difference in raw returns between sample portfolio A and B is greater (less) than the $1-\alpha_{th}$ (α_{th}) percentile return of the bootstrapped difference in returns distribution.

Over a 20-day post-event period, there is a strong and systematic underreaction for announcements of types 1, 2, and 3 earning statistically significant abnormal returns of 3.44%, 4.16% and 3.59% respectively. For the other types of announcements accompanied by an increase in volume, the market reaction is unbiased in that these events don't earn statistically significant abnormal returns over a 20-day period.[21] For the subsamples with no increase in volume, there is no significant underreaction, though there is a significant overreaction to news of type 4: capital structure related announcements are associated with a statistically significant abnormal return of -3.74% over a 20-day period.

Table 5.9 presents the results for negative events based on the type of announcement. Similar to the positive events sample, we find that the market underreaction to public announcements accompanied by an increase in volume is limited to announcements of type 1, 2 and 3. Negative events accompanied by an increase in volume and announcements of type 1, 2 and 3 earn statistically significant abnormal returns of -2.60%, -1.96% and -2.39% respectively over a 20-day period. For other types of announcements accompanied by an increase in volume, the market reaction is unbiased except for an overreaction to type 6 announcements: general business related information events earn statistically significant abnormal returns of 1.98% over a 20-day period. For events which did not have an increase in volume on day 0, the market reaction is unbiased except for an underreaction to announcements of types 1 and 3: events of type 1 and type 3 earn statistically significant abnormal returns of -1.93% and -3.01% respectively over a 20-day period. However, the sample size in both cases is small.

Overall, there is evidence of underreaction. With each additional criteria (public announcement, volume, and type of public announcement), the sample has shown stronger evidence of price continuation. For types 1, 2, and 3, an abnormal return of approximately 3.50% for positive events and –2.25% for negative events is large and potentially tradable. The extent of underreaction is much larger than previously documented, which is further magnified by the fact that our sample consists primarily of large firms and therefore makes the predictable price patterns potentially tradable. Also, the magnitude of drift observed following management's forecast of earnings is interesting given the potential bias in previous studies as they only control for beta risk. The large magnitude of underreaction to news of types 1, 2, and 3 suggests that these events create differences of beliefs among investors and so the market takes more time to adjust to this information. On the other hand, market reaction to news of Type 4, 5, 6, and 7 is generally unbiased. As a large proportion of news in these categories are likely to represent highly precise signals, it is possible that the market is able to adjust quickly to these information releases as there is resolution of some underlying uncertainty regarding firm value. We test for this possibility in the next section.

The evidence presented above is consistent with both strategic trading under

[21] We note that our test might lack statistical power to detect abnormal returns for certain types of announcements due to small sample sizes.

information asymmetry models and the investor sentiment hypothesis. However, type 4 announcements which include dividend announcements, do not experience any underreaction, probably because the announcements do not reflect a big change in dividends and so do not alter investors' beliefs to a large extent.[22] Later in Chapter 6, we provide a more direct test of strategic trading under information asymmetry and the investor sentiment hypotheses.

5.8 Resolution of uncertainty

In the previous section, we found that market reaction to news of Type 4, 5, 6, and 7 is generally unbiased. A potential reason for this is that news in these categories resolve some underlying uncertainty regarding firm value and so the market is able to adjust to this news quickly. In the previous section, the public announcements were divided into subsamples based on the similarity of the news and not based on whether or not they resolved uncertainty. Therefore, within each of the Type 4, 5, 6, and 7 news subsamples there exist events where the news did not resolve uncertainty. We therefore re-divide these events into groups based on whether or not we believe the news would have resolved uncertainty. We use our judgement to decide whether a particular news item would have resolved uncertainty. We believe that news related to mergers, acquisitions, asset sales, legal and legislative announcements, stock repurchases through a dutch-auction or fixed-price self tender offers, stock or debt issues, product related information,

[22] Dividend initiations and omissions or large dividend changes could alter investor beliefs. In our sample, public announcements for 3 positive and 13 negative events refer to a change in dividends. However, the announcements do not state whether the magnitude of dividend changes was large or whether the changes represent dividend initiations or omissions.

and business contracts would lead to resolution of uncertainty. News items which we believe will not resolve uncertainty comprises of open market share repurchases, hiring and firing of top management, joint ventures, and labor disputes. There are some news items for which we don't know whether or not they will resolve uncertainty and are grouped under the "don't know" category. News related to sales, general business information, debt redemption, and labor disputes fall under the "don't know" category.

Tables 5.10 presents the results for positive events based on whether or not the accompanying public announcement resolved uncertainty. For the positive events, we find that the market reacts quickly to news which resolve uncertainty. Positive events which resolve uncertainty and are accompanied by an increase in volume have *in*significant post-event abnormal returns over each of the different time periods following day 0. If the volume did not increase then the market takes a little more time as there is evidence of overreaction over a 5-day period following the news release. For positive events that did not resolve uncertainty we find that the market takes longer to adjust to the news. For these events we find that the last statistically significant abnormal return occurs during the Day 16-20 period if volume increased and during the Day 11-15 period if volume did not increase. Further, the market appears to overreact if the volume did not increase as the 20-day post-event abnormal returns are a statistically significant –2.55%. The market also takes longer to adjust to news for which we don't know whether uncertainty was resolved compared to those which resolved uncertainty.

Table 5.11 presents the results for the negative events based on whether or not the accompanying public announcement resolved uncertainty. Unlike the positive events, the market does not adjust quickly to negative events that resolved uncertainty. The last statistically significant abnormal return occurs during the Day 6-10 period if volume increased and during the Day 1-5 period window if volume did not increase. However, over a 20-day period the market reaction is unbiased for both the "volume increase" and "volume did not increase" subsamples. For negative events which did not resolve uncertainty, the market reacts quickly to the news. There are no statistically significant abnormal returns over any of the time periods following day 0 if volume increased. If volume did not increase then the market takes one day following the event to adjust to the news. Negative events for which we are not sure whether uncertainty was resolved take up to 20 days to adjust to the information.

Overall, the results suggest that the market adjusts quickly to positive events if the accompanying news led to resolution of uncertainty than otherwise. However, for the negative events the market takes longer to adjust to news which resolve certainty compared to those that do not. A possible reason for the difference in results between the positive and negative events sample is that the sample size of negative events which did not resolve uncertainty is small. Therefore, our test lacks statistical power to detect abnormal returns for negative events that did not resolve uncertainty.

Table 5.1
Returns to portfolios of positive and negative events

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio.

Events	**POSITIVE**			**NEGATIVE**		
Sample Size	2919			1954		
Trading Day	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns
[-5,-1]	0.82	0.10	0.51	-1.39***	-0.96***	0.39***
0	7.12***	6.91***	1.00***	-6.91***	-6.95***	0.00***
+1	0.25***	0.17***	0.48**	-0.29***	-0.34***	0.47***
[+1,+5]	-0.03***	-0.27***	0.47***	0.03	-0.05	0.52*
[+6,+10]	0.11	0.07	0.52**	-0.13	-0.12	0.50
[+11,+15]	0.15**	0.17**	0.51	-0.17**	-0.19**	0.49
[+16,+20]	0.21	0.09	0.49	-0.03	-0.08	0.49
[+1,+20]	0.47	0.08	0.50	-0.34**	-0.48**	0.49

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.2
Portfolio returns and public announcements

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal.

Events	**POSITIVE**						**NEGATIVE**					
Public Announcement	Yes			No			Yes			No		
Sample Size	851			2068			816			1138		
Trading Day	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns
[-5,-1]	0.55	0.02	0.50	0.93	0.13	0.51	-0.45***	-0.53***	0.43***	-2.06***	-1.27***	0.38***
0	8.32***	8.18***	1.00***	6.63***	6.39***	1.00***	-8.78***	-8.81***	0.00***	-5.57***	-5.61***	0.00***
+1	0.38***	0.33***	0.51	0.20**	0.11**	0.47***	-0.86***	-0.87***	0.42***	0.13	0.04	0.50
[+1,+5]	0.33	0.20	0.52	-0.17***	-0.46***	0.45***	-1.12***	-1.17***	0.44***	0.85***	0.74***	0.57***
[+6,+10]	0.50***	0.42***	0.55***	-0.05	-0.08	0.51	0.11	-0.12	0.50	-0.31	-0.11	0.49
[+11,+15]	0.40**	0.38**	0.53*	0.05	0.09	0.50	-0.15**	-0.30**	0.46**	-0.18	-0.11	0.51
[+16,+20]	0.26*	0.24*	0.50	0.19	0.03	0.49	0.05	0.03	0.50	-0.09	-0.15	0.47**
[+1,+20]	1.47***	1.25***	0.55***	0.06**	-0.39**	0.48*	-1.13***	-1.62***	0.42***	0.23	0.32	0.55***

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.3
Portfolio Returns, Public Announcements, and Volume Changes

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days.

Events	**POSITIVE**											
Public News	Yes						No					
Volume	increased			did not increase			increased			did not increase		
Sample Size	603			248			874			1194		
Trading Day	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns
[-5,-1]	0.93*	0.31*	0.53*	-0.37**	-0.71**	0.42***	1.59***	0.68***	0.57***	0.45**	-0.29**	0.47**
0	9.08***	8.96***	1.00***	6.49***	6.26***	1.00***	7.49***	7.27***	1.00***	6.00***	5.75***	1.00***
+1	0.49***	0.46***	0.53	0.12	0.01	0.47	0.34***	0.30***	0.49	0.10	-0.02	0.46***
[+1,+5]	0.59***	0.54***	0.55**	-0.30**	-0.64**	0.45*	0.00	-0.09	0.46***	-0.30***	-0.72***	0.44***
[+6,+10]	0.53***	0.47***	0.56***	0.45	0.31	0.52	0.19	0.11	0.51	-0.22*	-0.22*	0.50
[+11,+15]	0.48***	0.52***	0.51	0.19	0.02	0.56**	-0.06	0.08	0.48	0.14	0.10	0.51
[+16,+20]	0.41**	0.44**	0.50	-0.09	-0.22	0.50	0.00	-0.07	0.48	0.34	0.12	0.49
[+1,+20]	1.99***	1.98***	0.58***	0.19	-0.58	0.48	0.15	0.03	0.49	-0.01***	-0.70***	0.48*

Events	**NEGATIVE**											
Public news	Yes						No					
Volume	increased			did not increase			increased			did not increase		
Sample Size	653			163			489			649		
Trading Day	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Raw Return (%)	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns
[-5,-1]	-0.60***	-0.66***	0.42***	0.11	0.08	0.47	-2.45***	-1.89***	0.29***	-1.77***	-0.81***	0.42***
0	-9.48***	-9.47***	0.00***	-5.97***	-6.18***	0.00***	-6.29	-6.28***	0.00***	-5.02***	-5.11***	0.01***
+1	-0.87***	-0.87***	0.43***	-0.82***	-0.84***	0.41***	0.14	0.13*	0.54**	0.12	-0.03	0.48
[+1,+5]	-1.22***	-1.26***	0.43***	-0.71**	-0.77**	0.51	0.59	0.63***	0.59***	1.05***	0.81***	0.55***
[+6,+10]	0.24	-0.05	0.51	-0.38	-0.36	0.49	0.01	0.12	0.51	-0.55*	-0.29*	0.47*
[+11,+15]	-0.22**	-0.36**	0.46**	0.12	-0.07	0.49	0.01	-0.06	0.53*	-0.33	-0.14	0.50
[+16,+20]	0.17	0.04	0.51	-0.42	-0.02	0.47	-0.13	-0.23	0.47*	-0.06	-0.11	0.48
[+1,+20]	-1.05***	-1.68***	0.42***	-1.44**	-1.34**	0.44*	0.53	0.52	0.54**	0.00	0.17	0.55**

* significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level

Table 5.4
Regression results for Positive and Negative event firms

The models are estimated using ordinary least squares. BHARET(1-20) is the buy and hold return for the sample firm from day 1 to day 20 minus the mean buy and hold return of the bootstrapped control firm return distribution, DAY0 is the event day abnormal return, BHARET[-5,0] is the buy and hold abnormal return from 5 days preceding the event to the event day, PUBANN is a dummy variable equal to 1 if the event was accompanied by a public announcement, LOGABVOL is the log of the ratio of the event day standardized volume divided by the median standardized volume over 60 days preceding the event. t-statistics are in parentheses.

EVENTS	**POSITIVE**		**NEGATIVE**	
DEPENDENT VARIABLE	BHARET(1-20)		BHARET(1-20)	
INTERCEPT	-0.0069* (-1.960)	-0.0083*** (-2.673)	0.0032 (0.705)	-0.0007 (-0.156)
DAY0	-0.0996** (-2.143)		0.0545 (0.824)	
BHARET[-5,0]		-0.0725** (-2.350)		-0.0426 (-0.908)
PUBANN	0.0138*** (3.527)	0.0132*** (3.401)	-0.0199*** (-3.859)	-0.0211*** (-4.181)
LOGABVOL	0.0102*** (4.057)	0.0102*** (4.116)	0.0035 (1.093)	0.0011 (0.366)
ADJ R^2	0.0110	0.0113	0.0079	0.0080
SAMPLE SIZE	2919	2919	1954	1954

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1% level

Table 5.5
Abnormal Returns Bias and Event Type

Positive (Negative) events are where the day 0 abnormal price change is positive (negative). An event is classified as having being accompanied by a public announcement if a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days. VWRET[+1,+20] is the daily compounded CRSP value-weighted return over 20 days following the event. Beta bias is the beta for the sample portfolio minus the beta for the bootstrapped size control portfolio. T-statistics for the difference in means test are in parentheses.

Events	Public Announcement	Volume		VWRET [+1,+20] (%)	Beta Bias	Abnormal Return Bias	Sample Size
Positive				0.71	0.00	0.02	2919
Negative				0.81	-0.01	-0.03	1954
			Diff	-0.10	0.01	0.05	
				(-0.851)	(0.696)	(1.116)	
Positive	Yes			0.68	0.07	0.00	851
Negative	Yes			1.04	0.08	0.14	816
			Diff	-0.36*	-0.01	-0.14*	
				(-1.823)	(0.624)	(-1.852)	
Positive	No			0.73	-0.04	0.04	2068
Negative	No			0.66	-0.08	-0.15	1138
			Diff	0.07	0.04***	0.19***	
				(0.437)	(3.138)	(3.048)	
Positive	Yes	increased		0.50	0.09	0.01	603
Negative	Yes	increased		1.20	0.13	0.20	653
			Diff	-0.70***	-0.04	-0.19*	
				(-3.250)	(1.409)	(1.942)	
Positive	Yes	did not increase		1.11	0.02	-0.06	248
Negative	Yes	did not increase		0.36	-0.08	-0.07	163
			Diff	0.75*	0.10***	0.01	
				(1.669)	(2.632)	(0.050)	
Positive	No	increased		0.50	0.00	0.04	874
Negative	No	increased		0.82	-0.03	-0.09	489
			Diff	-0.32	0.03	0.13	
				(-1.376)	(1.282)	(1.371)	
Positive	No	did not increase		0.89	-0.06	0.04	1194
Negative	No	did not increase		0.54	-0.12	-0.20	649
			Diff	0.35*	0.06***	0.24***	
				(1.670)	(3.215)	(2.813)	

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.6
Abnormal Returns Bias, Public Announcements and Volume Changes

Positive (Negative) events are where the day 0 abnormal price change is positive (negative). An event is classified as having being accompanied by a public announcement if a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90^{th} percentile of the volume for the past 60 days. VWRET[+1,+20] is the daily compounded CRSP value-weighted return over 20 days following the event. Beta bias is the beta for the sample portfolio minus the beta for the bootstrapped size control portfolio. T-statistics for the difference in means test are in parentheses.

Events	Public Announcement	Volume		VWRET [+1,+20] (%)	Beta Bias	Abnormal Return Bias	Sample Size
Positive	Yes			0.68	0.07	0.01	851
Positive	No			0.73	-0.04	0.04	2068
			Diff	-0.05	0.11***	-0.03	
				(-0.289)	(6.381)	(-0.729)	
Negative	Yes			1.04	0.08	0.14	816
Negative	No			0.66	-0.08	-0.15	1138
			Diff	0.38*	0.16***	0.29***	
				(1.936)	(8.998)	(3.468)	
Positive	Yes	increased		0.50	0.09	0.01	603
Positive	Yes	did not increase		1.11	0.02	-0.06	248
			Diff	-0.61**	0.07**	0.07	
				(-2.138)	(2.300)	(0.674)	
Positive	No	increased		0.50	0.00	0.04	874
Positive	No	did not increase		0.89	-0.06	0.04	1194
			Diff	-0.39**	0.06***	0.00	
				(-2.084)	(3.690)	(-0.065)	
Negative	Yes	increased		1.20	0.13	0.20	653
Negative	Yes	did not increase		0.36	-0.08	-0.07	163
			Diff	0.84**	0.21***	0.27*	
				(1.290)	(5.705)	(1.717)	
Negative	No	increased		0.82	-0.03	-0.09	489
Negative	No	did not increase		0.54	-0.12	-0.20	649
			Diff	0.28	0.08***	0.11	
				(1.094)	(4.130)	(0.961)	

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.7
Types of Public Announcements

Type 1 :	Actual earnings announcement by management
Type 2 :	Forecast of earnings by management
Type 3 :	Analyst recommendations: recommendations by security analysts, and information regarding credit ratings by rating agencies.
Type 4 :	Capital structure related information: dividends, stock repurchases, stock/debt issues, and preferred stock/debt redemption.
Type 5 :	Restructuring related information: mergers, acquisitions, asset sales, hiring and firing of top management.
Type 6:	General business related information: sales, product related information, business contracts, and joint ventures.
Type 7:	Miscellaneous information: legal and legislative announcements, labor disputes.

Table 5.8
Portfolio Returns to Positive Events by Type of Public Announcement

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90^{th} percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**POSITIVE**									
Public Announcement	Type 1					Type 2				
Volume	increased		did not increase			increased		did not increase		
Sample Size	208		73			18		9		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	0.11	0.55*	-0.71*	0.43*		-0.67	0.33*	0.81	0.33	
0	8.03***	1.00***	6.75***	1.00***		8.65***	1.00***	7.41***	1.00***	
+1	0.53***	0.59***	0.34*	0.47	0.19	1.06**	0.56	-0.76	0.44	1.82**
[+1,+5]	1.03***	0.59***	0.27	0.52	0.76	0.95	0.61	-2.06*	0.22**	3.01*
[+6,+10]	1.16***	0.64***	0.66	0.49	0.50	1.76*	0.61	-1.33	0.33	3.09**
[+11,+15]	0.79***	0.56**	0.37	0.60**	0.42	-0.46	0.39	1.34	0.44	-1.80
[+16,+20]	0.47*	0.51	-0.37	0.47	0.84	1.92**	0.78***	1.37	0.56	0.55
[+1,+20]	3.44***	0.67***	0.89	0.53	2.55**	4.16**	0.83***	-0.70	0.44	4.86

Events	**POSITIVE**									
Public Announcement	Type 3					Type 4				
Volume	increased		did not increase			increased		did not increase		
Sample Size	102		33			37		38		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	1.13***	0.61**	-0.72	0.49		-1.39**	0.32**	-0.62	0.45	
0	8.32***	1.00***	6.59***	1.00***		6.69***	1.00***	5.41***	1.00***	
+1	0.94***	0.58*	0.34	0.64*	0.60*	0.49*	0.57	-0.06	0.50	0.55
[+1,+5]	0.80*	0.53	-0.98*	0.42	1.78**	1.01*	0.57	-0.53	0.58	1.54
[+6,+10]	-0.03	0.50	-0.16	0.55	0.13	0.83	0.57	-0.11	0.50	0.94
[+11,+15]	1.33***	0.59**	0.53	0.58	0.80	0.35	0.46	-1.66**	0.50	2.01**
[+16,+20]	1.40***	0.52	0.18	0.52	1.22	-1.77**	0.41	-1.28*	0.53	-0.49
[+1,+20]	3.59***	0.60**	-0.64	0.42	4.23**	0.27	0.51	-3.74**	0.40*	4.01**

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.8 (Continued)

Events	POSITIVE									
Public Announcement	Type 5					Type 6				
Volume	increased		did not increase			increased		did not increase		
Sample Size	136		41			70		41		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	0.59*	0.52	-0.48	0.46		0.23	0.51	-1.16*	0.32**	
0	12.76***	1.00***	6.05***	1.00***		7.10***	1.00***	6.47***	1.00***	
+1	0.31**	0.49	0.21	0.49	0.10	0.07	0.44	-0.65**	0.32**	0.72**
[+1,+5]	0.12	0.53	-0.47	0.39*	0.59	0.11	0.56	-1.55**	0.39*	1.66**
[+6,+10]	-0.59*	0.46	0.31	0.59	-0.90	0.41	0.60**	1.15*	0.56	-0.74
[+11,+15]	0.27	0.49	0.36	0.59	-0.09	-0.27	0.43	-0.15	0.51	-0.12
[+16,+20]	-0.23	0.42**	0.03	0.51	-0.26	0.87*	0.54	0.27	0.56	0.60
[+1,+20]	-0.45	0.50	0.27	0.44	-0.72	1.17	0.53	-0.51	0.56	1.68

Events	POSITIVE				
Public Announcement	Type 7				
Volume	increased		did not increase		
Sample Size	32		13		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	0.74	0.59	-0.66	0.31*	
0	7.77***	1.00***	4.43***	1.00***	
+1	-0.52**	0.25***	-0.36	0.39	-0.16
[+1,+5]	-1.57*	0.28***	-2.06**	0.31*	0.49
[+6,+10]	0.90	0.63*	-0.40	0.46	1.30
[+11,+15]	-0.21	0.38*	0.46	0.54	-0.67
[+16,+20]	0.78	0.59	-0.32	0.39	1.10
[+1,+20]	-0.26	0.38*	-2.25	0.46	1.99

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.9
Portfolio Returns to Negative Events by Type of Public Announcement

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90^{th} percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**NEGATIVE**									
Public Announcement	Type 1					Type 2				
Volume	increased		did not increase			increased		did not increase		
Sample Size	217		61			120		12		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-0.29	0.45	0.09	0.48		-0.64*	0.44	-0.32	0.33	
0	-9.79***	0.00***	-6.32***	0.00***		-11.20***	0.00***	-6.59***	0.00***	
+1	-1.30***	0.39***	-0.80***	0.43	-0.50*	-0.49**	0.48	-0.63	0.42	0.14
[+1,+5]	-1.84***	0.43**	-0.88*	0.48	-0.96*	-1.12**	0.43*	-0.48	0.42	-0.64
[+6,+10]	-0.47*	0.46*	-0.77	0.41*	0.30	-0.16	0.45	1.78	0.75**	-1.94*
[+11,+15]	-0.74**	0.43**	0.22	0.49	-0.96*	-0.63*	0.43*	0.92	0.67	-1.55
[+16,+20]	0.41*	0.51	-0.35	0.46	0.76	-0.07	0.49	-1.13	0.33	1.06
[+1,+20]	-2.60***	0.38***	-1.93**	0.36**	-0.67	-1.96**	0.36**	0.95	0.75**	-2.91

Events	**NEGATIVE**									
Public Announcement	Type 3					Type 4				
Volume	increased		did not increase			increased		did not increase		
Sample Size	132		17			43		23		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-1.97***	0.29***	0.45	0.41		0.47	0.51	-0.53	0.44	
0	-7.76***	0.01***	-5.65***	0.00***		-8.21***	0.00***	-5.98***	0.00***	
+1	-1.12***	0.40**	-2.26***	0.24**	1.14**	0.13	0.49	-0.43	0.48	0.56
[+1,+5]	-1.11***	0.42**	-2.41**	0.47	1.30	-1.09*	0.44	-3.47***	0.44	2.38**
[+6,+10]	-0.76**	0.54	-0.19	0.59	-0.57	0.57	0.63**	-0.20	0.52	0.77
[+11,+15]	-0.18	0.44*	-1.28	0.47	1.10	-1.05*	0.44	0.38	0.57	-1.43
[+16,+20]	-0.27	0.48	1.15	0.53	-1.42	1.00*	0.56	1.17*	0.61	-0.17
[+1,+20]	-2.39***	0.45	-3.01*	0.35	0.62	-0.40	0.47	-2.27	0.57	1.87

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 5.9 (Continued)

Events	**NEGATIVE**									
Public Announcement	Type 5					Type 6				
Volume	increased		did not increase			increased		did not increase		
Sample Size	52		21			66		20		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-0.22	0.40*	0.49	0.52		-0.69	0.44	-0.56	0.50	
0	-10.02***	0.00***	-5.76***	0.00***		-9.67***	0.00***	-5.78***	0.00***	
+1	-1.30***	0.39**	-0.19	0.38	-1.11**	-0.32*	0.49	-0.53*	0.40	0.21
[+1,+5]	-1.44**	0.37**	0.32	0.62	-1.76*	-0.09	0.46	1.11	0.60	-1.20
[+6,+10]	0.05	0.54	-0.83	0.48	0.88	2.51***	0.56	-0.46	0.50	2.97**
[+11,+15]	0.55	0.48	1.00	0.52	-0.45	0.61	0.58	-1.28*	0.40	1.89**
[+16,+20]	-0.29	0.44	0.06	0.52	-0.35	-0.91*	0.58	-0.36	0.35*	-0.55
[+1,+20]	-1.16	0.40*	0.46	0.48	-1.62	1.98**	0.56	-0.77	0.30**	2.75

Events	**NEGATIVE**				
Public Announcement	Type 7				
Volume	increased		did not increase		
Sample Size	23		9		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-0.06	0.52	1.63*	0.67	
0	-7.45***	0.00***	-8.05***	0.00***	
+1	-0.03	0.48	-2.02***	0.44	1.99**
[+1,+5]	-0.77	0.48	2.98**	0.67	-3.75**
[+6,+10]	-0.61	0.61	0.08	0.33	-0.69
[+11,+15]	-0.26	0.48	-2.15	0.22**	1.89
[+16,+20]	0.59	0.65*	-1.04	0.44	1.63
[+1,+20]	-1.08	0.48	-0.26	0.56	-0.82

*, **, *** significant at the 10 % level, 5% level, and 1% level respectively.

Table 5.10
Portfolio Returns to Positive Events and Resolution of Uncertainty

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are restricted to those accompanied by a public announcement of Type 4, 5, 6, and 7 and subdivided based on whether the public announcement regarding the firm resolved uncertainty. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**POSITIVE (TYPE 4, 5, 6, & 7)**									
Resolution of Uncertainty	Yes					No				
Volume	increased		did not increase			increased		did not increase		
Sample Size	205		69			46		39		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	0.39	0.54	-0.84*	0.36**		-0.04	0.46	-0.49	0.51	
0	10.86***	1.00***	5.79***	1.00***		7.08***	1.00***	5.30***	1.00***	
+1	0.01	0.42**	-0.08	0.42*	0.09	0.92***	0.63**	-0.21	0.46	1.13**
[+1,+5]	-0.27	0.49	-1.12**	0.36**	0.85	1.48**	0.59	-0.65	0.46	2.13**
[+6,+10]	-0.08	0.53	0.02	0.51	-0.10	-0.12	0.54	0.36	0.59	-0.48
[+11,+15]	0.28	0.48	0.26	0.57	0.02	-0.33	0.41	-1.29**	0.51	0.96
[+16,+20]	0.07	0.45*	0.01	0.51	0.06	-1.35**	0.46	-0.80	0.59	-0.55
[+1,+20]	0.01	0.49	-0.88	0.45	0.89	-0.44	0.48	-2.55**	0.44	2.11

Events	**POSITIVE (TYPE 4, 5, 6, & 7)**				
Resolution of Uncertainty	Don't Know				
Volume	increased		did not increase		
Sample Size	24		25		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-0.57	0.25***	-0.95	0.32**	
0	7.35***	1.00***	6.78***	1.00***	
+1	0.18	0.46	-0.37	0.40	0.55
[+1,+5]	-0.01	0.54	-1.09	0.60	1.08
[+6,+10]	1.23*	0.54	1.39*	0.56	-0.16
[+11,+15]	-0.47	0.38	-0.51	0.48	0.04
[+16,+20]	1.40*	0.63	-0.47	0.44	1.87*
[+1,+20]	2.16	0.58	-0.65	0.56	2.81

*, **, *** significant at the 10 % level, 5% level, and 1% level respectively.

Table 5.11
Portfolio Returns to Negative Events and Resolution of Uncertainty

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are restricted to those accompanied by a public announcement of Type 4, 5, 6, and 7 and subdivided based on whether the public announcement regarding the firm resolved uncertainty. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**NEGATIVE (TYPE 4, 5, 6, & 7)**									
Resolution of Uncertainty	Yes					No				
Volume	increased		did not increase			increased		did not increase		
Sample Size	131		52			29		13		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-0.37	0.44*	0.17	0.52		0.59	0.59	-0.66	0.39	
0	-9.27***	0.00***	-6.57***	0.00***		-9.23***	0.00***	-5.30***	0.00***	
+1	-0.79***	0.42**	-0.22	0.50	-0.57**	0.48	0.55	-1.42***	0.31*	1.90***
[+1,+5]	-1.16***	0.41**	1.27**	0.62**	-2.43***	-0.10	0.45	-1.85**	0.39	1.75
[+6,+10]	1.05***	0.57*	-0.37	0.44	1.42**	0.21	0.62*	-0.12	0.54	0.33
[+11,+15]	0.06	0.48	-0.20	0.48	0.26	-0.49	0.55	0.10	0.39	-0.59
[+16,+20]	0.06	0.58**	0.55	0.52	-0.49	0.71	0.52	0.03	0.39	0.68
[+1,+20]	-0.03	0.47	1.19	0.52	-1.22	0.52	0.52	-1.90	0.39	2.42

Events	**NEGATIVE (TYPE 4, 5, 6, & 7)**				
Resolution of Uncertainty	Don't Know				
Volume	increased		did not increase		
Sample Size	24		8		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-5,-1]	-0.38	0.38	0.61	0.63	
0	-8.71***	0.00***	-4.64***	0.00***	
+1	0.28	0.54	-1.45**	0.13**	1.73**
[+1,+5]	0.29	0.50	-8.29***	0.50	8.58***
[+6,+10]	1.28*	0.58	-1.13	0.63	2.41*
[+11,+15]	1.16	0.58	-0.43	0.50	1.59
[+16,+20]	-2.01**	0.38	-2.07*	0.50	0.06
[+1,+20]	0.71	0.50	-11.78***	0.25*	12.49***

*, **, *** significant at the 10 % level, 5% level, and 1% level respectively.

CHAPTER 6

DETERMINANTS OF POST-EVENT ABNORMAL RETURNS

In this chapter, we attempt to identify the determinants of post-event abnormal returns. We limit our sample to events with public announcements and volume increases as these events have the most pronounced underreaction and represent the sample in which investors are diversely informed. We use regression analysis to examine whether the magnitude of underreaction in this sample can be explained by strategic trading models under information asymmetry or investor sentiment models.

6.1 Strategic trading under information asymmetry

Kyle (1985) and Foster and Vishwanathan (1996) show that in the presence of asymmetric information, investors will trade strategically to maximize their returns. This will lead to information being incorporated in prices slowly over time. Empirical findings support the hypothesis that investors trade strategically. Glosten and Harris (1988) find that the ratio of the adverse selection component of the spread (measured by the "Kyle lambda" (λ)) to the market price is negatively related to the average trade size. Brennan and Subrahmanyam (1998) confirm the contemporaneous correlation between Kyle's lambda and average trade size after controlling for other variables that may affect trade size.

Then there is evidence that institutional traders trade strategically. Keim and Madhavan (1995) find that institutional orders take on average 1.80 days to be executed;

though many transactions could occur on a single day. Chan and Lakonishok (1995) find that more than one-half of the dollar value of institutions' trade packages takes four or more days to be executed. In some cases, the trade package could take up to 16 or more business days to be executed. The principal weighted return (i.e. the average price change weighted by the dollar size of the trade) from the open of the package to its close is approximately 1% for buys and -0.35% for sells after adjusting for the return on a size matched control portfolio. Barclay and Warner (1993) find that medium-sized trades (500 to 9,900 shares) account for a majority of the cumulative price change in a security. If price movements are mainly due to informed traders' private information, then their results are consistent with the hypothesis that informed traders trade strategically by breaking their orders into medium-sized trades.

If strategic trading in the presence of information asymmetry will lead to information being incorporated in prices slowly over time, then the post-event abnormal return should be related to the level of information asymmetry following the event. Following Glosten and Harris (1988), the adverse selection component of the bid-ask spread over 20 days following the event is estimated and used as a measure of the degree of information asymmetry.[23] An intercept is included to account for possible misspecification in equation (3) as suggested by Brennan and Subrahmanyam (1998).

$$P_{it} - P_{it-1} = \alpha + \lambda Q_{it} D_{it} + \Psi(D_{it} - D_{it-1}) + \varepsilon_{it} \qquad (3)$$

where P is the transaction price, Q is the trade size, D = 1 if a trade is classified as a buy

[23] Like Glosten and Harris (1988), we do not consider inventory holding costs. Prior empirical studies have found that inventory holding costs are small (see Madhavan and Smidt (1991)). We also ignore discreteness of price quotes. Glosten and Harris (1988) find that discreteness is not crucial for estimating λ.

and -1 if it is classified as a sell. Subscripts *t* and *t-1* refer to the current and previous periods respectively. λ and Ψ capture the adverse selection and transitory component of the spread respectively. We use the Lee and Ready (1991) methodology to classify trades as buys and sells. If the trade occurs above (below) the prevailing quote midpoint it is regarded as a buy (sell). If the trade occurs at the prevailing quote midpoint, it is classified using the tick-test.[24] We use 20 days of post-event data to estimate equation (3), ignoring overnight price changes as they are likely to be influenced by dividends and overnight information arrival. The adverse selection component is included as an important determinant of post-event abnormal returns. We expect a positive (negative) correlation between post-event abnormal returns and the adverse selection component of the spread for positive (negative) events.

6.2 Investor sentiment

The investor sentiment hypothesis of Barberis, Shleifer, and Vishny (1998) states that investors are slow to revise their beliefs. In their model, any new information has a temporary and permanent component. When the information is not consistent with their priors, investors overestimate the random component and underestimate the permanent component. With passage of time and with more information, they gradually alter their beliefs implying that prices take longer to react because of investor resistance to new information. An implication of the investor sentiment hypothesis is that the greater the shock of new information, the larger would be the process of adjustment. An information

[24] Approximately 2.92% of trades are unclassified. Among the trades that could be classified, 52.94% are buys and 47.06% are sells.

will have a larger shock if it is negatively related to the type of information released in prior periods, i.e. investors will take more time to adjust to good (bad) news events if bad (good) news was released in prior periods. The type of information released in prior periods is measured by the pre-event abnormal return over 120 to 6 days prior to the event (PREAR[-120,-6]). The prior period window does not include the 5 days preceding the event as it is likely to reflect leakage of information arriving on day 0. We expect a negative correlation between pre-event abnormal return (PREAR[-120,-6]) and the post-event abnormal return.

6.3 Regression model

In addition to a measure of information asymmetry and the pre-event abnormal return, the regression specification for relating the post-event abnormal returns to firm characteristics includes the following independent variables as controls for other factors likely to influence abnormal returns.

i) An options dummy (OPTFLAG) is included as firms with exchange listed options may respond to news events differently from firms without exchange listed options. Manaster and Rendleman (1982) suggest that option markets provide a superior investment vehicle for some traders due to lower transaction costs, higher liquidity, higher leverage, and no short sale restrictions. They find that closing prices of call options contain information about equilibrium stock prices that is not contained in the closing stock price. Jennings and Starks (1986) find that stock prices of firms which don’t have exchange listed options take more time to reflect information conveyed by quarterly earnings announcements relative to firms which have exchange listed options. Therefore, the magnitude of underreaction may be higher for firms that do not have exchange listed options.

ii) Firm size (LSIZE). We include the log of firm size as an explanatory variable to control for the likelihood that small firms will take longer to reflect new information due to infrequent trading or slower dissemination of information, and smaller analyst and institutional interest. We have tried to control for infrequent trading by requiring all firms to have non-zero trading volume on each of the 60 days preceding the event.

iii) Volatility of returns (VOLATILITY). The sample includes both firms with high stock return volatility and firms with low stock return volatility. Since high volatility firms are likely to experience higher price changes than low volatility firms, the standard deviation of returns over the 60 days prior to the event is used as a control variable.

iv) Event Day Abnormal Return (DAY0). If the event day abnormal return is high (say, 15%) for a firm, it is possible that the price continuation, if it occurs due to incomplete adjustment, will be higher for that firm than for a firm whose event day abnormal return is low (say, 2%). Accordingly, the Day 0 abnormal return is included as an independent variable.

v) Information Leakage (PREAR[-5,-1]). The magnitude of underreaction is likely to be smaller for firms which had leakage of information prior to the event. The pre-event abnormal return over 5 days preceding the event is used to capture leakage of information.

vi) Institutional Holdings (FINST). Sias and Starks (1997) find that individual security daily return autocorrelations are positively correlated with the level of institutional ownership. To capture herding among institutional stock holders, we include the fraction of stock held by institutions as in Sias and Starks (1997). Institutional holdings are measured as of the last calendar quarter preceding the event.

vii) Type of announcement (TYPE1 to TYPE7): The types of announcement are represented by dummy variables to examine whether each type of announcement is related to the magnitude of underreaction following the event. One of the seven types is excluded to avoid a singular matrix. Type 4 is excluded because the post-event abnormal returns for these announcements is close to zero.

Based on the above criteria, we specify equation (4) below:

$$
\begin{aligned}
BHARET_i = {} & \alpha + \beta_1[1000(\lambda_i/PRC_i)] + \beta_2 LSIZE_i + \beta_3 OPTFLAG_i + \beta_4 DAY0_i + \\
& \beta_5 VOLATILITY_i + \beta_6 PREAR[-5,-1]_i + \beta_7 PREAR[-120,-6]_i + \beta_8 FINST_i + \\
& \beta_9 TYPE1_i + \beta_{10} TYPE2_i + \beta_{11} TYPE3_i + \beta_{12} TYPE5_i + \beta_{13} TYPE6_i + \\
& \beta_{14} TYPE7_i + \varepsilon_i \qquad (4)
\end{aligned}
$$

where BHARET is the 20-day buy and hold abnormal return for the sample firm, PRC is the average of the midpoint of the closing bid-ask prices over 20 days following the event. The remaining variables are defined earlier.

6.4 Regression results

Table 6.1 reports the ordinary least squares regression results for the positive and negative events with a public announcement and an increase in volume on day 0.[25] The results reveal that for the positive event firms the magnitude of underreaction is not significantly related to the degree of information asymmetry following the event. For

[25] There is a small decrease in the sample size because we require 30 classifiable trades to estimate λ. This along with the condition that we obtain non-negative estimates of λ reduced our sample size from 603 to 581 for the positive events and from 653 to 635 for the negative events.

negative events, however, the level of information asymmetry is negatively correlated with post-event abnormal returns. This supports our hypothesis that the magnitude of underreaction is greater if information asymmetry is greater. The difference in results for the positive events and the negative events samples is not easily explained. Alternative regression models do not change the basic results. In accordance with Chandra and Balachandran (1992), we obtain coefficient estimates using weighted least squares where the weight is the reciprocal of the standard deviation of returns. The results using weighted least squares are reported in Table 6.2 and are similar to those using ordinary least squares.

We also use an alternative to Kyle's λ to measure information asymmetry. Since the greater the information asymmetry, the greater is likely to be the volatility of prices on the event day, we use the standard deviation of transaction prices (STDPRC) on the event day divided by the event day's average price, as a measure of the degree of information asymmetry following the announcement.[26] If the information is released during trading hours then STDPRC will overstate information asymmetry as it will straddle two different price regimes. Therefore, we restrict the sample to only those firms that made the relevant announcement during non-trading hours as reported on the Dow Jones News Wire or the Wall Street Journal.[27] We also require the firms to have 30 trades on the event day to calculate the standard deviation of prices. This restricts our analysis to 219 positive

[26] Instead of using the standard deviation of prices, standard deviation of returns can be used. However, this measure is problematic. For example, if the price increases continuously at a constant rate of say 0.5% return per transaction, then the standard deviation of returns will be zero though the price may have moved from $50 to $55 during the day. If the price moves within a narrow range, then the bid-ask bounce will give the impression of high volatility. For these reasons, we prefer the standard deviation of prices.

[27] News is characterized as being released overnight if it appears in the news media before the market opens on the event day or after the market closed on the previous trading day.

events and 240 negative events. As STDPRC is likely to be affected by the volatility of the market on the event day, we standardize it by market volatility. Market volatility is measured as the standard deviation of 5-minute prices of the most actively traded S&P500 futures contract divided by the average contract price. Table 6.3 reports the ordinary least square estimates and Table 6.4 reports the weighted least square estimates with this new measure of differences of opinion and the abbreviated sample. Even with this new measure of information asymmetry, we don't find evidence of a significant relationship between information asymmetry and the magnitude of underreaction for positive events. For the negative events, we continue to find that the magnitude of underreaction is significantly related with information asymmetry. However, this relationship is significant only when we estimate the coefficients using ordinary least squares.

Returning to other variables in the regression model which uses Kyle's λ in Table 6.1, we find that the coefficient of pre-event abnormal return from day -120 to day -6 is negative in sign and statistically significant for both the positive events sample and the negative events sample. This implies that the smaller the pre-event abnormal return, the larger is the post-event abnormal return for positive events. Similarly for the negative events, the larger the pre-event abnormal return, the more negative is the post-event abnormal return. Though this is not an explicit empirical implication of Barberis, Shleifer, and Vishny (1998), the result is consistent with the notion of investor sentiment.

Among the remaining independent variables, the coefficients of types 1 and 3 announcements are statistically significant for the positive events sample. The coefficient of type 2 announcement is large (3.97%) but not statistically significant probably because of the sample size. For the negative events sample, the coefficients of types 1 to 3 announcements are statistically insignificant though they are smaller than -2%.

None of the other coefficients is significant. Size is no longer relevant perhaps because we have excluded infrequently traded stocks and low priced stocks. Similarly, event day abnormal return is irrelevant perhaps due to the focus on large price change events. Option listing, pre-event volatility, and information leakage do not seem to impact stock price performance around major information events. In contrast to Sias and Starks (1997), the insignificance of the coefficient on institutional stockholding points to the possibility that herding or institution-induced momentum strategies do not matter in our sample.

On the whole, the above evidence is consistent with the investor sentiment hypothesis of Barberis, Shleifer, and Vishny (1998). Investors take more time to adjust to good (bad) news events if bad (good) news was released in prior periods.

6.5 Post-event abnormal returns and investor sentiment

The regression results in Table 6.1 indicate a correlation between the type of information that arrived prior to the event and post-event return regularities. We use this new information to construct finer subsamples to examine whether the nature of price continuation is different.

In Tables 6.5 to 6.7, we subdivide the large price change, public announcement, and volume increase sample into two subsamples based on whether the pre-announcement abnormal return over 120 to 6 days prior to the event is negative or positive. Instead of using the median or another more elaborate criteria for the pre-event abnormal return, we choose a simple positive-negative criterion because it is simple to use for constructing a trading strategy. Fortunately, the criterion does not result in subsamples that are very different in size.

The results in Tables 6.5 to 6.7 are consistent with the regression results in Table 6.1. Table 6.5 shows that pre-event abnormal returns significantly affect the post-event abnormal returns. For positive events preceded by a negative abnormal return, the 20-day post-event abnormal return is 2.49% that is significantly greater than the 1.26% earned by positive events preceded by a positive abnormal return. Similarly, negative events preceded by a positive return earn a post-event abnormal return of –2.65% that is significantly greater than the –0.81% earned by the other negative events. The fraction of firms exhibiting price continuation is also significantly greater if the pre-event abnormal return is opposite in sign to the sign of the event day return.

Results by type of announcement are presented in Table 6.6 for positive events and in Table 6.7 for negative events. The price continuations are surprisingly large: the abnormal return over a 20-day period is an extremely large 4.85% for positive events preceded by a negative pre-event return if the news is of types 1, 2 or 3. At least two-thirds of the firms experience a positive post-event drift. Further, the post-event abnormal return for events preceded by a negative pre-event abnormal return is significantly larger than those for events preceded by a positive pre-event abnormal return. The results for the negative events are similar. The 20-day abnormal return is –3.50% for negative events preceded by a positive pre-event return and if the news is of types 1, 2 or 3. The results for other news types are mixed probably because it is more difficult for investors to form priors about news that arrive erratically.

Table 6.1
OLS Regression Results for Positive and Negative event firms that had a Public Announcement and Increase in Volume

The models are estimated using ordinary least squares. BHARET(1-20) is the buy and hold return for the sample firm from day 1 to day 20 minus the mean buy and hold return of the bootstrapped control firm return distribution, λ is the adverse selection component of the bid ask spread measured over 20 days following the event, PRC is the average of the midpoint of the closing bid-ask prices over 20 days following the event, LSIZE is the log of the firm size, OPTFLAG is a dummy variable equal to 1 if the firm has exchange listed options on its stock, DAY0 is the event day abnormal return, VOLATILITY is the standard deviation of returns over 60 days preceding the event day, PREAR[-5,-1] is the buy and hold abnormal return over 5 days preceding the event, PREAR[-120,-6] is the buy and hold abnormal return over 120 to 6 days preceding the event, FINST is the fraction of shares held by institutions, and TYPE i is a dummy variable equal to 1 if the announcement is of Type i. t-statistics are in parentheses.

EVENTS	**POSITIVE**	**NEGATIVE**
DEPENDENT VARIABLE	BHARET(1-20)	BHARET(1-20)
INTERCEPT	0.0358 (0.607)	0.0294 (0.512)
1000(λ/PRC)	-0.1930 (-1.040)	-0.4446** (-2.216)
LSIZE	-0.0022 (-0.596)	-0.0018 (-0.485)
OPTFLAG	-0.0037 (-0.343)	-0.0043 (-0.389)
DAY0	0.0633 (0.967)	0.0142 (0.172)
VOLATILITY	-0.5767 (-0.932)	0.0005 (0.063)
PREAR[-5,-1]	-0.0531 (-0.644)	-0.1576 (-1.589)
PREAR[-120,-6]	-0.0336** (-2.101)	-0.0392*** (-2.808)
FINST	0.0057 (0.249)	0.0055 (0.218)
TYPE 1	0.0377** (2.333)	-0.0226 (-1.318)
TYPE 2	0.0397 (1.555)	-0.0233 (-1.262)
TYPE 3	0.0372** (2.142)	-0.0288 (-1.588)
TYPE 5	-0.0068 (-0.394)	-0.0098 (-0.468)
TYPE 6	0.0127 (0.698)	0.0208 (1.046)
TYPE 7	0.0012 (0.056)	-0.0077 (-0.287)
ADJ R^2	0.0335	0.0226
SAMPLE SIZE	581	635

* significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level

Table 6.2
WLS Regression Results for Positive and Negative event firms that had a Public Announcement and Increase in Volume

The models are estimated using weighted least squares. BHARET(1-20) is the buy and hold return for the sample firm from day 1 to day 20 minus the mean buy and hold return of the bootstrapped control firm return distribution, λ is the adverse selection component of the bid ask spread measured over 20 days following the event, PRC is the average of the midpoint of the closing bid-ask prices over 20 days following the event, LSIZE is the log of the firm size, OPTFLAG is a dummy variable equal to 1 if the firm has exchange listed options on its stock, DAY0 is the event day abnormal return, VOLATILITY is the standard deviation of returns over 60 days preceding the event day, PREAR[-5,-1] is the buy and hold abnormal return over 5 days preceding the event, PREAR[-120,-6] is the buy and hold abnormal return over 120 to 6 days preceding the event, FINST is the fraction of shares held by institutions, and TYPE i is a dummy variable equal to 1 if the announcement is of Type i. t-statistics are in parentheses.

EVENTS	**POSITIVE**	**NEGATIVE**
DEPENDENT VARIABLE	BHARET(1-20)	BHARET(1-20)
INTERCEPT	0.0468 (0.845)	0.0136 (0.249)
$1000(\lambda/PRC)$	-0.1496 (-0.997)	-0.3922** (-2.063)
LSIZE	-0.0033 (-0.952)	-0.0014 (-0.397)
OPTFLAG	-0.0021 (-0.209)	-0.0029 (-0.286)
DAY0	0.0559 (0.742)	0.0052 (0.064)
VOLATILITY	-0.8700 (-1.297)	0.0528 (0.276)
PREAR[-5,-1]	-0.0574 (-0.649)	-0.1864* (-1.801)
PREAR[-120,-6]	-0.0360** (-2.115)	-0.0357** (-2.231)
FINST	0.0037 (0.167)	0.0018 (0.074)
TYPE 1	0.0467*** (3.088)	-0.0114 (-0.730)
TYPE 2	0.0509** (2.050)	-0.0144 (-0.851)
TYPE 3	0.0464*** (2.819)	-0.0244 (-1.460)
TYPE 5	0.0048 (0.293)	-0.0075 (-0.399)
TYPE 6	0.0296* (1.734)	0.0203 (1.105)
TYPE 7	0.0113 (0.530)	0.0171 (0.725)
ADJ R^2	0.0373	0.0141
SAMPLE SIZE	581	635

* significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level

Table 6.3
OLS Regression Results for Positive and Negative event firms that had an Overnight Public Announcement and Increase in Volume

The models are estimated using ordinary least squares. BHARET(1-20) is the buy and hold return for the sample firm from day 1 to day 20 minus the mean buy and hold return of the bootstrapped control firm return distribution, STDPRC is the standard deviation of trade prices on the event day divided by the average price for the day, LSIZE is the log of the firm size, OPTFLAG is a dummy variable equal to 1 if the firm has exchange listed options on its stock, DAY0 is the event day abnormal return, VOLATILITY is the standard deviation of returns over 60 days preceding the event day, PREAR[-5,-1] is the buy and hold abnormal return over 5 days preceding the event, PREAR[-120,-6] is the buy and hold abnormal return over 120 to 6 days preceding the event, FINST is the fraction of shares held by institutions, and TYPE i is a dummy variable equal to 1 if the announcement is of Type i. t-statistics are in parentheses.

EVENTS	**POSITIVE**	**NEGATIVE**
DEPENDENT VARIABLE	BHARET(1-20)	BHARET(1-20)
INTERCEPT	0.0638 (0.816)	0.0590 (0.856)
STDPRC	0.0002 (0.251)	-0.0009* (-1.748)
LSIZE	-0.0054 (-1.075)	-0.0031 (-0.672)
OPTFLAG	0.0237 (1.640)	-0.0211 (-1.510)
DAY0	0.0376 (0.512)	-0.0359 (-0.372)
VOLATILITY	0.3845 (0.441)	0.0107 (1.198)
PREAR[-5,-1]	0.0827 (0.811)	-0.0562 (-0.439)
PREAR[-120,-6]	0.0200 (0.877)	-0.0706*** (-3.160)
FINST	-0.0206 (-0.663)	0.0102 (0.310)
TYPE 1	0.0348 (1.492)	-0.0094 (-0.485)
TYPE 2	0.0338 (0.917)	-0.0231 (-1.122)
TYPE 3	-0.0720 (-1.283)	-0.0597 (-1.212)
TYPE 5	-0.0170 (-0.686)	-0.0077 (-0.329)
TYPE 6	0.0161 (0.548)	0.0633** (2.461)
TYPE 7	0.0127 (0.394)	-0.0602 (-1.356)
ADJ R^2	0.0576	0.0926
SAMPLE SIZE	219	240

* significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level

Table 6.4
WLS Regression Results for Positive and Negative event firms that had an Overnight Public Announcement and Increase in Volume

The models are estimated using weighted least squares. BHARET(1-20) is the buy and hold return for the sample firm from day 1 to day 20 minus the mean buy and hold return of the bootstrapped control firm return distribution, STDPRC is the standard deviation of trade prices on the event day divided by the average price for the day, LSIZE is the log of the firm size, OPTFLAG is a dummy variable equal to 1 if the firm has exchange listed options on its stock, DAY0 is the event day abnormal return, VOLATILITY is the standard deviation of returns over 60 days preceding the event day, PREAR[-5,-1] is the buy and hold abnormal return over 5 days preceding the event, PREAR[-120,-6] is the buy and hold abnormal return over 120 to 6 days preceding the event, FINST is the fraction of shares held by institutions, and TYPE i is a dummy variable equal to 1 if the announcement is of Type i. t-statistics are in parentheses.

EVENTS	**POSITIVE**	**NEGATIVE**
DEPENDENT VARIABLE	BHARET(1-20)	BHARET(1-20)
INTERCEPT	0.0716 (0.980)	0.0649 (1.001)
STDPRC	0.0003 (0.351)	-0.0007 (-1.416)
LSIZE	-0.0048 (-1.043)	-0.0042 (-0.992)
OPTFLAG	0.0190 (1.342)	-0.0137 (-1.054)
DAY0	0.0640 (0.747)	-0.0277 (-0.299)
VOLATILITY	-0.0184 (-0.020)	0.0202 (0.131)
PREAR[-5,-1]	0.0433 (0.391)	-0.0420 (-0.321)
PREAR[-120,-6]	0.0178 (0.730)	-0.0667*** (-2.729)
FINST	-0.0347 (-1.156)	0.0070 (0.228)
TYPE 1	0.0338 (1.554)	-0.0029 (-0.165)
TYPE 2	0.0360 (0.990)	-0.0147 (-0.799)
TYPE 3	-0.0692 (-1.235)	-0.0475 (-1.047)
TYPE 5	-0.0164 (-0.705)	-0.0118 (-0.565)
TYPE 6	0.0176 (0.630)	0.0626*** (2.624)
TYPE 7	0.0128 (0.403)	-0.0554 (-1.354)
ADJ R^2	0.0514	0.0672
SAMPLE SIZE	219	240

* significant at the 10 % level, ** significant at the 5 % level, *** significant at the 1 % level

Table 6.5
Portfolio Returns to Events Accompanied by a Public Announcement and Increase in Volume, by Sign of Pre-Event Abnormal Return

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days.

Events	**POSITIVE**					**NEGATIVE**				
Public Announcement	Yes					Yes				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	259		344			309		344		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	16.22***	1.00***	-18.79***	0.00***		20.09***	1.00***	-15.51***	0.00***	
[-5,-1]	0.66**	0.57**	0.07	0.51		-0.71***	0.41***	-0.63***	0.43***	
0	8.64***	1.00***	9.21***	1.00***		-9.50***	0.00***	-9.43***	0.00***	
+1	0.04	0.51	0.77***	0.54*	-0.73***	-0.80***	0.43**	-0.93***	0.42***	0.13
[+1,+5]	0.26	0.52	0.75***	0.56***	-0.49	-1.79***	0.41***	-0.79***	0.45**	1.00***
[+6,+10]	0.36	0.56**	0.55**	0.57***	-0.19	-0.23	0.50	0.09	0.52	-0.32
[+11,+15]	0.41*	0.52	0.61***	0.51	-0.20	-0.51**	0.44**	-0.24	0.47	-0.27
[+16,+20]	0.26	0.51	0.55**	0.50	-0.29	-0.05	0.48	0.12	0.54*	-0.17
[+1,+20]	1.26***	0.54*	2.49***	0.61***	-1.23*	-2.65***	0.36***	-0.81*	0.47	-1.84***

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 6.6
Portfolio Returns to Positive Event Firms that had an increase in volume, by Type of Public Announcement and Sign of Pre-Event Abnormal Return

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**POSITIVE**									
Public Announcement	Type 1					Type 2				
Volume	increased					Increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	110		98			7		11		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	16.73***	1.00***	-16.40***	0.00***		14.78**	1.00***	-27.34***	0.00***	
[-5,-1]	0.19	0.58**	-0.01	0.52		-0.80	0.29	-0.68	0.36	
0	7.91***	1.00***	8.14***	1.00***		7.89***	1.00***	9.06***	1.00***	
+1	0.25	0.56*	0.85***	0.61**	-0.60**	-0.85*	0.29	2.24***	0.73*	-3.09**
[+1,+5]	0.59*	0.53	1.55***	0.66***	-0.96*	-0.49	0.43	1.84*	0.73*	-2.33
[+6,+10]	0.45	0.60**	2.01***	0.67***	-1.56***	3.02**	0.86**	0.93	0.46	2.09
[+11,+15]	0.73**	0.52	0.85**	0.60**	-0.12	-0.46	0.29	-0.51	0.46	0.05
[+16,+20]	0.62*	0.53	0.33	0.49	0.29	-0.16	0.71	3.09**	0.82**	-3.25*
[+1,+20]	2.30***	0.61**	4.71***	0.74***	-2.41**	2.10	0.86**	5.58**	0.82**	-3.48

Events	**POSITIVE**									
Public Announcement	Type 3					Type 4				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	41		61			15		22		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	14.21***	1.00***	-20.40***	0.00***		15.21***	1.00***	-21.98***	0.00***	
[-5,-1]	0.53	0.61*	1.46**	0.61**		-0.42	0.40	-2.01**	0.27**	
0	7.79***	1.00***	8.71***	1.00***		6.94***	1.00***	6.56***	1.00***	
+1	0.15	0.54	1.49***	0.61**	-1.34***	0.76*	0.73**	0.28	0.46	0.48
[+1,+5]	0.23	0.51	1.22**	0.54	-0.99	0.93	0.67*	1.09	0.50	-0.16
[+6,+10]	-0.35	0.42	0.23	0.56	-0.58	0.82	0.53	0.75	0.59	0.07
[+11,+15]	1.58**	0.71***	1.20**	0.51	0.38	-0.37	0.53	0.87	0.41	-1.24
[+16,+20]	0.24	0.37**	2.23***	0.62**	-1.99**	-4.85***	0.40	0.32	0.41	-5.17**
[+1,+20]	1.71	0.51	4.92***	0.66***	-3.21**	-3.85**	0.47	3.23**	0.55	-7.08**

Table 6.6 (continued)

Events	**POSITIVE**									
Public Announcement	Type 5					Type 6				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	46		90			25		45		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	19.35***	1.00***	-18.87***	0.00***		14.22***	1.00***	-17.16***	0.00***	
[-5,-1]	2.06***	0.65**	-0.19	0.46		1.30*	0.52	-0.37	0.51	
0	12.62***	1.00***	12.84***	1.00***		7.20***	1.00***	7.03***	1.00***	
+1	-0.46*	0.41	0.70***	0.52	-1.16***	0.46	0.52	-0.16	0.40*	0.62
[+1,+5]	-0.15	0.52	0.22	0.53	-0.37	0.94	0.60	-0.33	0.53	1.27
[+6,+10]	-0.05	0.48	-0.91**	0.46	0.86	0.79	0.68**	0.26	0.56	0.53
[+11,+15]	-0.28	0.46	0.52	0.51	-0.80	0.10	0.48	-0.42	0.40*	0.52
[+16,+20]	0.10	0.44	-0.44	0.41**	0.54	1.56**	0.72**	0.45	0.44	1.11
[+1,+20]	-0.20	0.41	-0.51	0.54	0.31	3.26**	0.60	0.09	0.49	3.17*

Events	**POSITIVE**				
Public Announcement	Type 7				
Volume	increased				
BHAR[-120,-6]	Positive		Negative		
Sample Size	15		17		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	13.47**	1.00***	-20.89***	0.18***	
[-5,-1]	-0.07	0.47	1.35*	0.71**	
0	8.50***	1.00***	7.13***	1.00***	
+1	-1.17***	0.20**	0.08	0.29**	-1.25**
[+1,+5]	-2.04*	0.27**	-1.16	0.29**	0.88
[+6,+10]	0.48	0.53	1.23	0.71**	-0.75
[+11,+15]	-1.35	0.33*	0.76	0.41	-2.11*
[+16,+20]	1.54*	0.60	0.11	0.59	1.43
[+1,+20]	-1.52	0.33*	0.91	0.41	-2.43

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 6.7
Portfolio Returns to Negative Event Firms which had an increase in volume, by Type of Public Announcement and Sign of Pre-Event Abnormal Return

Buy and hold returns for different holding periods are presented. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The events are subdivided based on whether a public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**NEGATIVE**									
Public Announcement	Type 1					Type 2				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	111		106			49		71		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	22.21***	1.00***	-15.07***	0.00***		14.36***	1.00**	-16.45***	0.27***	
[-5,-1]	-0.51	0.44	-0.05	0.46		-0.93*	0.39*	-0.42	0.48	
0	-9.84***	0.00***	-9.75***	0.00***		-11.31***	0.00***	-11.12***	0.00***	
+1	-1.55***	0.35***	-1.01***	0.43*	-0.54**	-0.47**	0.43	-0.52**	0.51	0.05
[+1,+5]	-2.67***	0.41**	-0.96**	0.44	-1.71***	-1.86**	0.43	-0.60	0.42*	-1.26*
[+6,+10]	-0.59	0.45	-0.32	0.46	-0.27	0.70	0.51	-0.67	0.41*	1.37*
[+11,+15]	-0.67*	0.45	-0.76*	0.42**	0.09	-1.01*	0.39*	-0.34	0.47	-0.67
[+16,+20]	0.14	0.45	0.72*	0.58*	-0.58	-0.29	0.43	0.07	0.54	-0.36
[+1,+20]	-3.80***	0.31***	-1.35**	0.46	-2.45**	-2.59**	0.31***	-1.57*	0.39**	-1.02

Events	**NEGATIVE**									
Public Announcement	Type 3					Type 4				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	61		71			22		21		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	16.04***	1.00***	-16.21***	0.00***		25.17***	1.00***	-15.80***	0.00***	
[-5,-1]	-1.95***	0.23***	-1.98***	0.34***		1.04	0.55	-0.19	0.48	
0	-7.40***	0.00***	-8.09***	0.01***		-8.57***	0.00***	-8.03***	0.00***	
+1	-0.82***	0.44	-1.36***	0.37**	0.54*	0.17	0.50	0.04	0.48	0.13
[+1,+5]	-1.43***	0.36**	-0.85*	0.47	-0.58	-0.11	0.50	-2.16**	0.38	2.05*
[+6,+10]	-1.07*	0.54	-0.50	0.54	-0.57	-0.40	0.50	1.50*	0.76***	-1.90*
[+11,+15]	-0.02	0.39**	-0.32	0.48	0.30	-0.69	0.46	-1.31*	0.43	0.62
[+16,+20]	-0.90*	0.48	0.28	0.48	-1.18*	1.84**	0.64	0.08	0.48	1.76
[+1,+20]	-3.61***	0.38**	-1.37*	0.51	-2.24*	0.45	0.50	-1.40	0.43	1.85

Table 6.7 (Continued)

Events	NEGATIVE									
Public Announcement	Type 5					Type 6				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	23		29			33		33		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	21.80***	1.00***	-12.52***	0.00***		18.94***	1.00***	-13.85***	0.00***	
[-5,-1]	0.40	0.44	-0.72	0.38*		-0.64	0.46	-0.73	0.42	
0	-10.34***	0.00***	-9.74***	0.00***		-10.1***	0.00***	-9.24***	0.00***	
+1	0.06	0.57	-2.34***	0.24***	2.40***	-0.19	0.58	-0.44*	0.39	0.25
[+1,+5]	-2.31**	0.30**	-0.73	0.41	-1.58*	-0.33	0.42	0.14	0.49	-0.47
[+6,+10]	-1.49*	0.39	1.24*	0.66**	-2.73**	2.33***	0.58	2.66***	0.55	-0.33
[+11,+15]	0.15	0.39	0.79	0.55	-0.64	-0.62	0.55	1.88***	0.61	-2.50**
[+16,+20]	-1.26*	0.39	0.47	0.48	-1.73*	0.55	0.55	-2.39***	0.61	2.94***
[+1,+20]	-4.87***	0.30**	1.75	0.48	-6.62***	1.84	0.49	2.27*	0.64*	-0.43

Events	NEGATIVE				
Public Announcement	Type 7				
Volume	increased				
BHAR[-120,-6]	Positive		Negative		
Sample Size	10		13		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
[-120,-6]	38.49***	1.00***	-17.94***	0.00***	
[-5,-1]	-0.75	0.60	0.39	0.46	
0	-7.82***	0.00***	-7.17***	0.00***	
+1	-0.17	0.40	0.04	0.54	-0.21
[+1,+5]	-1.05	0.40	-0.62	0.54	-0.43
[+6,+10]	-0.47	0.60	-0.71	0.62	0.24
[+11,+15]	0.29	0.60	-0.56	0.39	0.85
[+16,+20]	0.93	0.80**	0.32	0.54	0.61
[+1,+20]	-0.64	0.50	-1.59	0.46	0.95

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

CHAPTER 7

TRADING STRATEGY

In this chapter, we test whether the predictable price patterns observed hold out-of-sample and whether they are of economic significance after explicitly taking into account transaction costs. The evidence uncovered so far suggest that a trading strategy of buying (selling) positive (negative) event firms accompanied by an increase in volume and news relating to earnings announcements, management earnings forecasts, or analyst recommendations and selling (buying) them after 20 days should earn abnormal returns. Further, we expect to earn higher abnormal returns if the pre-event abnormal return is negative (positive) for positive (negative) events.

We implement this trading strategy by constructing our sample based on the universe of NYSE/AMEX common stocks over the period 1993 to 1994. The events are restricted to lie on or between Jan 1, 1993 and Dec 1,1994. The last 20 days of 1994 are reserved for examining the post-event returns. Closing bid and ask prices are obtained from the Trade and Quote (TAQ) database. We begin with a sample of 12,810 large price change events, events that experienced an abnormal return more than three standard deviations away from the mean.

In accordance with construction of the sample in Chapter 4, other screens reduce the sample size. Excluding events with no large price change over preceding 20 days reduces the sample to 8,559 events. There are only 6,750 events after deleting events where the number of outstanding shares changed by more than 1% over preceding 60 trading days. The three microstructure related screens: closing price not less than $10 on event day, a positive trading volume on each of the 60 days preceding the event, and restriction to the top four size quintiles relative to universe of NYSE/AMEX stocks generates a sample of 3,649 events.

There are 2,185 positive events and 1,464 negative events. Table 7.1 shows that firm characteristics are similar to those in Table 4.1. The magnitude of abnormal returns and the price per share are very close. The size of an average positive event firm seems to have increased much more than the size of a negative event firm. Most firms in our sample are larger than the average NYSE/AMEX firm.

We found earlier that events accompanied by a significant increase in volume and a public announcement relating to earnings or analyst recommendations generate excess returns. There are 394 positive events and 368 negative events that meet the above criteria. The positive events earned an average abnormal return of 7.53% on event day while the negative events lost an abnormal 9.24% on event day. Table 7.2 presents the post-event abnormal returns for these events. There is evidence of underreaction: positive event firms continue to earn positive abnormal returns cumulating to a significant 2.18% by the end of 20 days following the event. Similarly, negative event firms continue to lose ending up with an abnormal return of –2.40% by the end of the 20-day period. A negative abnormal return for the negative events indicates the profits that can be earned with a short position in the stock. The returns for the positive events are smaller in magnitude relative to the sample firms over the 1990-1992 period, however, they are still economically significant and much larger than previously documented in the literature. For the negative events, the magnitude of abnormal returns is similar to those for the

1990-1992 sample.

The returns in Table 7.2 are based on the mid-point of bid and ask prices and do not take into account the bid-ask spread. Also, given the significant abnormal return on day 1, it is possible that the stocks in our sample cannot be bought at the closing price on day 0. Therefore, we compute 20-day post-event returns for positive events based on purchases at the ask price at 10 a.m. on day 1 and sales at the bid price at 3:50 p.m. on day 20 for positive events. For negative events, we short sell at the bid price at 10 a.m. on day 1 and cover the short sales at the ask price at 3:50 p.m. on day 20. We believe it is relatively easy to trade at the 10 a.m. and 3:50 p.m. prices. The use of bid and ask prices should result in a conservative estimate of the transaction costs as many market orders can be executed at a better price than the prevailing bid and ask quotes.[28] After taking into account transaction costs, the 20-day post event abnormal returns are a statistically significant 1.04% for positive events and -1.51% for negative events.

In the previous chapter based on 1990-1992 data, we found that the magnitude of underreaction is larger if positive (negative) event firms are preceded by a negative (positive) abnormal return. We therefore examine whether the same holds with out-of-sample data. The results reported in Table 7.3 show that this holds only for the positive events sample. The 20-day post-event abnormal return is 2.64% if the event was preceded by a negative abnormal return and 1.54% if the event was preceded by a positive abnormal

[28] Knez and Ready (1997) show that the price improvement measured as the difference between the execution price of an order and the prevailing bid or ask quotes, decrease as the size of the order approaches the quoted depth, and becomes negative for larger orders. They note that this is particularly important for small firms as they have lower quoted depths. Given that our sample consists primarily of large firms with none in the bottom size quintile, we believe that it should not have a significant effect on our trading profits.

return. Also, the difference in abnormal returns is statistically significant. However, for the negative events, the 20-day post-event abnormal return is -2.29% if the event was preceded by a positive abnormal return and -2.47% otherwise.

To summarize, we tested our trading strategy using out-of-sample data. Based on two years data for 1993-94, we find strong evidence of price continuations following large positive events and large negative events. Net of transaction costs, a simple trading strategy generates an abnormal return of 1.04% for positive events and –1.51 for negative events over a 20-trading day period. On an annual basis, such strategies would generate abnormal returns in the range of 12-18%.

Table 7.1

Characteristics of out-of-sample trading strategy event firms

	Positive Events					Negative Events				
Sample Size	2185					1464				
	Mean	Quartile 1	Median	Quartile3	Std Dev	Mean	Quartile 1	Median	Quartile3	Std Dev
ABNORMAL RETURN (%)	6.86	4.49	6.00	8.06	4.13	-6.95	-8.22	-5.90	-4.39	4.10
PRICE	32.41	18.56	27	40.94	20.93	30.82	18.84	26.28	37.63	19.84
FIRM SIZE (in $ billions)	3.20	0.33	0.96	2.84	7.45	3.04	0.44	1.06	2.97	6.81
SIZE QUINTILE	3.93	3	4	5	1.00	4.06	3	4	5	0.93

ABNORMAL RETURN is the market adjusted abnormal return for the sample firm (adjusted for the value weighted CRSP NYSE/AMEX index).
PRICE is the midpoint of the closing bid-ask prices on day 0.
FIRM SIZE is the size of the firm at the beginning of the year.
SIZE QUINTILE are formed based on the universe of NYSE/AMEX firms at the beginning of the year. Size quintile 1 represents the smallest firms and size quintile 5 represents the largest firms.

Table 7.2
Out of Sample Test: Returns to Positive and Negative Event Firms

Buy and hold returns are presented for event firms with an increase in volume and a public announcement of type 1, type 2, or type 3. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90^{th} percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**POSITIVE**		**NEGATIVE**	
Public Announcement	Type 1, 2, & 3		Type 1, 2, & 3	
Volume	increased		increased	
Sample Size	394		368	
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns
[-5,-1]	-0.21	0.47*	-0.65***	0.42***
0	7.53***	1.00***	-9.24***	0.00***
+1	0.46***	0.52	-0.55***	0.41***
[+1,+5]	0.61***	0.52	-1.07***	0.42***
[+6,+10]	0.76***	0.56**	-0.69***	0.38***
[+11,+15]	0.36**	0.53	-0.55***	0.43***
[+16,+20]	0.43**	0.50	-0.11	0.51
[+1,+20]	2.18***	0.59***	-2.40***	0.38***
[+1,+20 (after transaction costs)]	1.04***		-1.51***	

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

Table 7.3
Out of Sample Test: Returns to Positive and Negative Event Firms conditional on pre-event abnormal returns

Buy and hold returns are presented for event firms with an increase in volume and a public announcement of type 1, type 2, or type 3 conditional on pre-event abnormal returns. Day 0 is the day of the event when the large abnormal price change occurred. Positive (Negative) events are where the day 0 abnormal price change is positive (negative). The abnormal return is the sample portfolio return minus the average return to a bootstrapped control portfolio. The public announcement regarding the firm was reported in the Dow Jones News Wire or Wall Street Journal. Firms are classified into the "volume increased" sample if the event day volume is at or above the 90th percentile of the volume for the past 60 days. Types of announcements are defined in Table 5.7.

Events	**POSITIVE**					**NEGATIVE**				
Public Announcement	Type 1, 2, & 3					Type 1, 2, & 3				
Volume	increased					increased				
BHAR[-120,-6]	Positive		Negative			Positive		Negative		
Sample Size	173		221			136		232		
Trading Day	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Buy and Hold Abnormal Return (%)	Proportion of Positive Abnormal Returns	Difference In Abnormal Returns
-[120,-6]	17.32***	1.00***	-15.17***	0.00***		15.18***	1.00***	-15.54***	0.00***	
[-5,-1]	-0.22	0.46	-0.24	0.48		-0.48*	0.46	-0.77***	0.39***	
0	7.77***	1.00***	7.33***	1.00***		-8.55***	0.00***	-9.64***	0.00***	
+1	0.30**	0.51	0.59***	0.53	-0.29*	-0.68***	0.36***	-0.47***	0.44**	0.21
[+1,+5]	0.52*	0.49	0.66***	0.54	-0.14	-0.49*	0.45	-1.37***	0.40***	0.88**
[+6,+10]	0.61**	0.54	0.85***	0.57**	-0.24	-0.68**	0.38***	-0.69***	0.38***	0.01
[+11,+15]	0.34	0.52	0.39*	0.53	-0.05	-0.70**	0.38***	-0.44**	0.46*	-0.26
[+16,+20]	0.07	0.45*	0.71***	0.54	-0.64**	-0.43	0.49	0.08	0.51	-0.51
[+1,+20]	1.54***	0.57**	2.64***	0.60***	-1.10*	-2.29***	0.38***	-2.47***	0.38***	0.18
[+1,+20 (after transaction costs)]	0.68		1.35***		-0.67	-1.49***		-1.56***		0.07

* significant at the 10 % level
** significant at the 5 % level
*** significant at the 1 % level

CHAPTER 8

CONCLUSIONS

8.1 Concluding remarks

We begin our inquiry into the ability of three distinct characteristics of information signals to predict future returns by selecting large price change events. Consistent with prior evidence, we find no evidence of tradable price regularities following large price events. As we progress towards evaluating the predictive ability of other information characteristics, we find that the total sample consists of subsamples that do exhibit post-event return regularities. Large price changes accompanied by a public announcement display price continuations whereas large price changes without any accompanying news do not. Conditional on volume increases, large price change events with accompanying public announcements show even stronger evidence of price continuation. At the other extreme, large price events without an accompanying public announcement or an increase in volume reveal a tendency towards price reversals.

Evidence of price continuation becomes more important for news of certain types. Large price change events with a significant increase in volume and with news of types 1 to 3 (earnings announcements, management earnings forecasts, and analyst recommendations) reveal a post-event drift of about +3.50% for positive events and about –2.25% for negative events. The extent of underreaction is more severe than that reported in previous papers, which is further magnified by the fact that our sample consists primarily of large firms and so makes the predictable price patterns potentially tradable.

Further, the role of volume in increasing the magnitude of underreaction is new to the literature. We also find that the market reaction to news related to restructuring, capital structure changes, general business issues, and legal and legislative announcements is generally unbiased. For these events, we find some support for the reasoning that the market is able to adjust quickly to the new information as there is resolution of some underlying uncertainty regarding firm value.

We examine two explanations for the observed price continuation: strategic trading under information asymmetry and investor sentiment. There is only weak support for strategic trading under information asymmetry models in our sample. On the other hand, we find broad support for the investor sentiment hypothesis. Further, the post-event drift does not depend on the fraction of shares held by institutions. This implies that institution-induced momentum strategies are probably not responsible for the drift.

If investors are slow to change their beliefs then the magnitude of underreaction should be greater for information events with larger shocks. An information will have a larger shock if it is negatively related to the type of information released in prior periods, i.e. investors will take more time to adjust to good (bad) news events if bad (good) news was released in prior periods. We use the pre-event abnormal returns to proxy for the type of information released in prior periods. When we split the sample based on pre-event abnormal returns, we find that the price continuations are largest for positive (negative) events preceded by negative (positive) pre-event abnormal returns. The 20-day abnormal return is about +4.85% (-3.50%) for positive (negative) events preceded by negative (positive) pre-event abnormal returns and accompanied by an increase in volume and news related to earnings announcements, management earnings forecasts, or analyst recommendations.

An out of sample test of a trading strategy of buying (selling) positive (negative) event firms accompanied by an increase in volume and news relating to earnings announcements, management earnings forecasts, or analyst recommendations earns significant 20-day abnormal returns of 1% to 1.5% after transaction costs (excluding commission costs).

The evidence in this paper has implications for the market efficiency literature and for event studies. The large magnitude of drift observed brings into question the notion of short-term efficiency of prices. For event studies, the results imply that a 2-day window may be insufficient to capture the entire impact of the event. The drift is especially important for cross-sectional studies because the drift can vary significantly depending on event day volume and investor beliefs.

8.2 Limitations

We would like to note that the results in this study are based on the assumption that a size control portfolio is the appropriate benchmark to use to measure abnormal returns. If this is not the case, then our measure of abnormal returns is potentially biased. Though mis-estimation of beta risk cannot explain a significant proportion of the observed abnormal returns, there could be other potential risk factors on which our sample firms load differently from the control firms. Also, if the positive (negative) event sample firms undergo a systematic increase (decrease) in expected returns around the event, then our measure of drift is possibly upward biased. However, we feel that it is unlikely that a biased benchmark could explain the large magnitude of drift observed in this study.

Though we find that the market reaction to news related to mergers, acquisitions, legal and legislative issues, etc. is generally unbiased, the sample sizes for these news categories is small. Therefore, our study was limited in its ability to uncover predictable price patterns for these news categories. Further research which covers a larger time period in order to construct a relatively large sample needs to be done to examine whether the results observed for these news categories hold with a larger sample. Also, we exclude small firms from our study. Blume, Easley and O'Hara (1994) conjecture that past data should be more useful in predicting future returns for small stocks. Therefore, we have perhaps excluded firms for which the analyses undertaken in this study would be most useful. However, we believe that it is unlikely that this is the case. Small firms face high transaction costs and therefore it is unlikely that any return regularities observed for these stocks could be profitably exploited.

8.3 Extensions

The results in this study has implications for research which use past trading volume to predict future returns. The different price patterns observed for the "volume increase" category depending on whether or not there was a public news on the event day highlights the importance of trying to distinguish between volume generated by speculative traders from volume generated by liquidity traders. Though our methodology of standardizing volume by aggregate market volume and conditioning the volume statistic on public announcements is a first step in this regard, it is by no means perfect. Alternative methodologies need to be developed in this direction. A possible alternative could be based on the study by Barclay and Warner (1993). Under the assumption that price changes occur primarily due to speculative trades, one could identify the trade sizes which account for a majority of the price change for a given security. Using volume generated by trades in these trade size categories could potentially be a better measure of volume generated by speculative traders, and could help improve return predictability.

Another potential area of future research is to examine whether the ability of the characteristics of information signals to predict future returns varies across industries. Blume, Easley and O'Hara (1994) note that technical analysis will be more profitable for stocks in which there is greater uncertainty regarding its true value. This is because there is more to be learnt about the value of such stocks from market data. Therefore, it is likely that a trading strategy which conditions on the characteristics of information signals would be more profitable if it focuses on industries facing a high level of economic uncertainty, like high-tech industries.

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